InterSim III Interface

Manual

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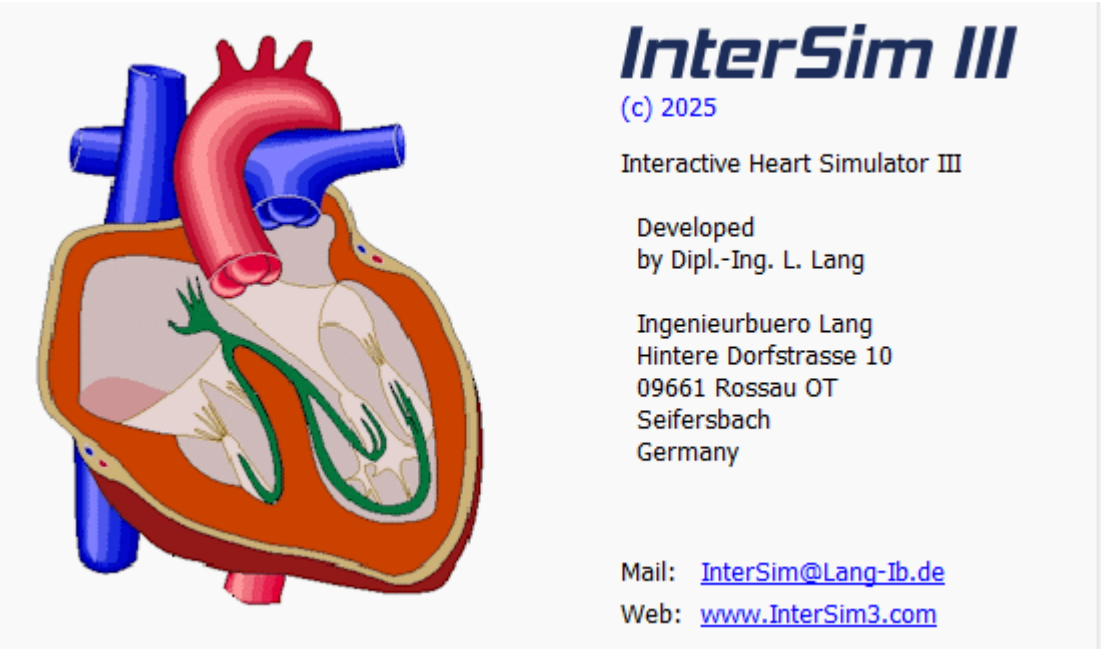


This manual is valid for application version 1.6.9295 and later.

Release History

Release June 2025

New

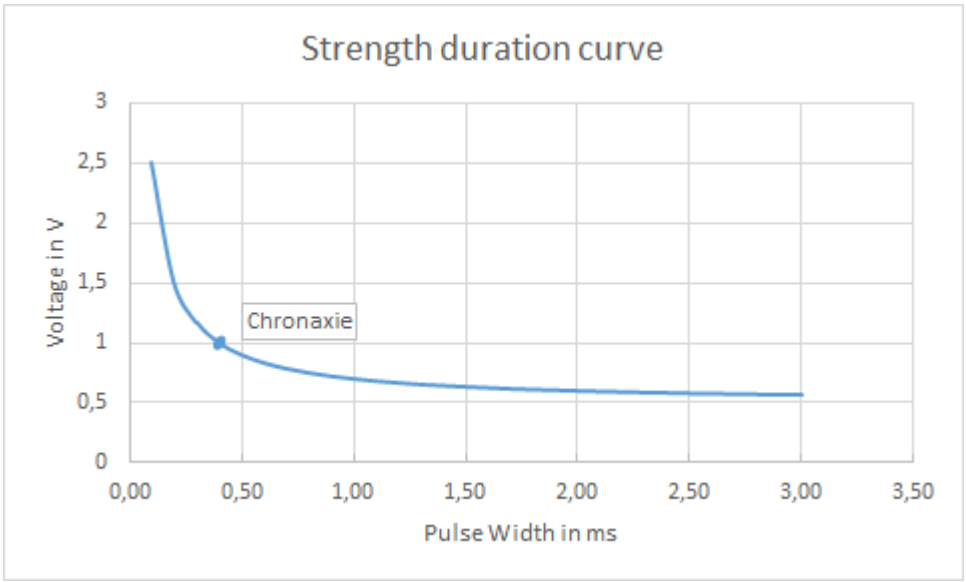
System Settings

Some system settings that are not affected by a reset are now available directly in the corresponding dialogs via the gear icon.

- T Wave Amplitude affects also surface ECGs
- With temporary pacemakers, you can switch between voltage or current thresholds.

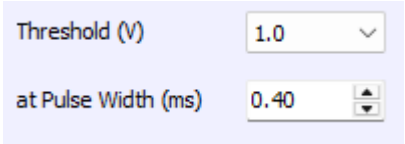
Thresholds with Pulse Width

With pacing, InterSim follows a strength duration curve.



The picture shows the curve for the InterSim settings

Threshold = 1 V and
Pulse Width = 0.4 ms
(chronaxie point)



In previous releases of InterSim, the pulse width was set to 0.4 ms. Now it's possible to set the pulse width for ab better adjustment of the strength duration curve.

See Atrial PM Parameters, Right Ventricular PM Parameters, and Left Ventricular Pacing Thresholds.

New Device Types

With the new release, two new device types are introduced.

- Temporary/External
- Conduction System Pacing

See Device Type.

Current Thresholds for Temporary Pacemakers

Medtronic's temporary/external pacemakers work with current instead of voltage thresholds. The pacemaker dialog can now be switched to the use of current threshold values.

See mA Thresholds for Temporary Pacemakers.

Current of Injury

It is now possible to simulate a Current of Injury in the atrial and right ventricular channels. The Current of Injury decreases over time and switches off automatically after 5 minutes.

See Miscellaneous.

New ATP Response Feature

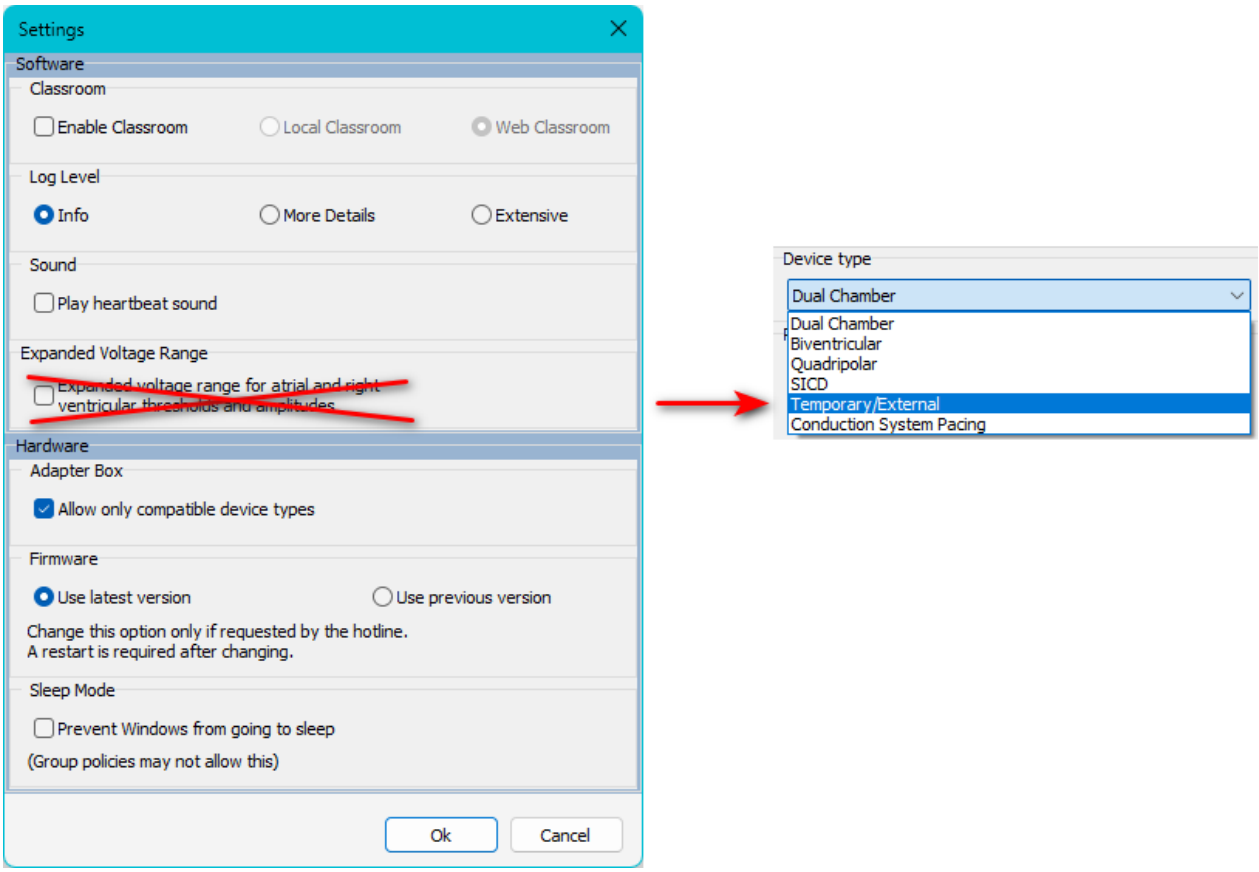
The new ATP response function also works with the distance to the tachycardia cicuit and better maps the heart's response to ATP.

See ATP.

Changed

Removal of the Expanded Voltage Range checkbox

The Expanded Voltage Range checkbox has been removed due to the new Temporary/External Pacemaker device type.



See Settings, Device Type.

Larger Output Spikes with Temporary Pacemakers

Temporary Pacemakers generate larger output spikes in the ECG.

AV Block III

An AV block III only has an antegrade effect as with InterSim II.

See Blocks.

Adapter Box Info

The adapter box info has been expanded.

See Info Tab.

Fixed

Heart Sound Output

The heart sound output is now assigned to the correct events.

See Heartbeat Sound.

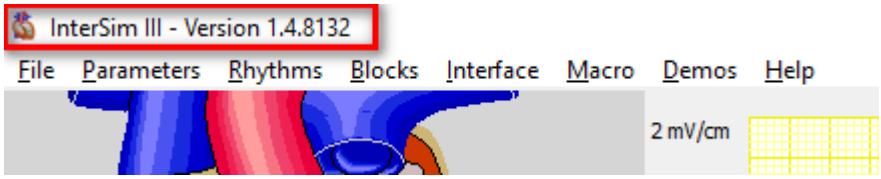
Home Screen

The most important controls and displays are grouped together on the home screen:

- See the wavefront propagation, pacing and sensing in the heart window.
- Choose the appropriate device type in the Device Type combo box list.
- Select the most important parameters in the Parameters group box.
- Trigger premature contractions using the buttons in the Premature Contractions group box.
- See the most important parameters in the Current State group box at a glance.
- Get a better overview through the ECG.

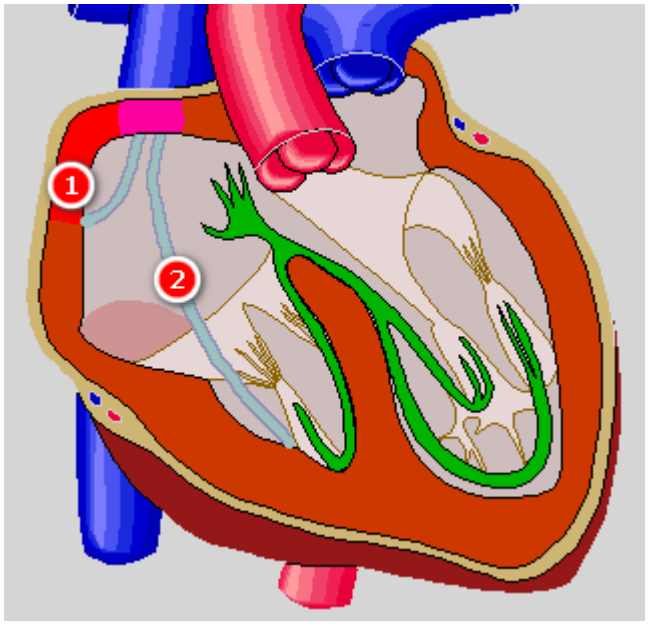
Title Bar

The title bar shows the name of the application and the current software version.



Animated Heart

The heart window illustrates the wavefront propagation, pacing and sensing as shown in the figure below. The Animated Heart is only visible if there is enough space on the screen. The image changes with the selected Device Type.



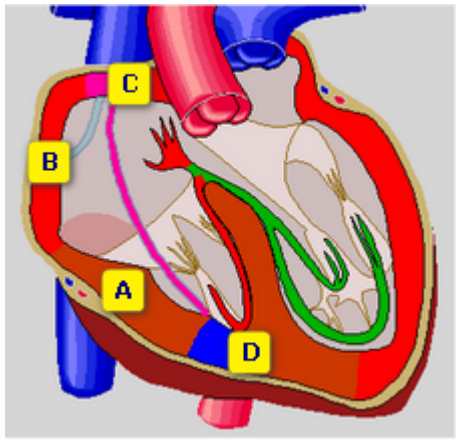
1 Myocardium

A
Brown: repolarized

B
Red: depolarized

C
Magenta: automaticity or paced

D
Blue: stimulus in vulnerable phase

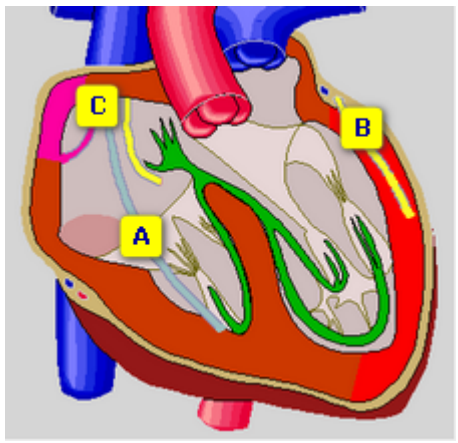


2 Lead

A
Gray: inactive

B
Yellow: sensing

C
Magenta: pacing



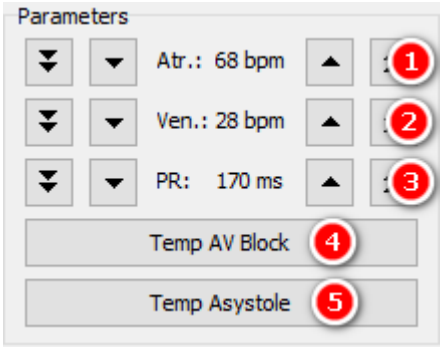
Device Type

Choose the appropriate device type that matches your device. Some settings are shown or hidden depending on this type:

- display of LV pace values
- LV ECG trace
- Left Ventricle Setup
- CSP Parameters
- SICD Parameters

If an adapter box is connected, additional restrictions may apply.
The SICD device type is visible after a SICD HV adapter has been connected for the first time

Parameters



1 Atrial Rate
Use the buttons to manually control the intrinsic sinus node rate.
See also Parameters/Rates

2 Ventricular Rate
Use the buttons to manually control the intrinsic ventricular escape rate.
See also Parameters/Rates

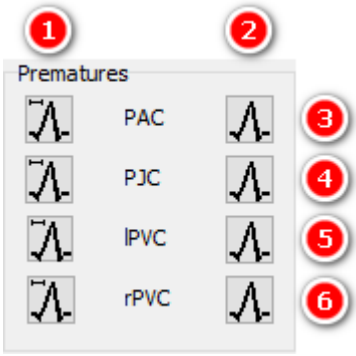
3 PR Interval
Use the buttons to manually control the interval between the intra-atrial P wave and the intraventricular R wave in case of 1:1 conduction.
See also Parameters/Intervals

4 Temp AV Block
This button allows temporary application of 3rd degree AV block while pressed.
See also Blocks

5 Temp AV Block + Asystole
This button allows temporary application of 3rd degree AV block and asystole while pressed.
See also Blocks

Premature Contractions

Use these buttons to create premature contractions.



1 Premature Contractions with Coupling Interval
The buttons in the left column create premature contractions after an intrinsic action. The delay is set by the

Premature Coupling Interval.
Hold a button to create a series of premature contractions.

2 Immediate Premature Contractions
The buttons in the right column create premature contractions immediately. If the tissue is just refractory no premature contraction will be created.
Hold a button to create a series of premature contractions.

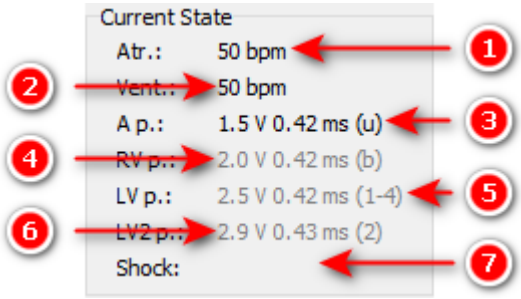
3 PAC
These two buttons create premature atrial contractions.

4 PJC
These two buttons create premature junctional contractions.

5 IPVC
These two buttons create premature left ventricular contractions. The left PVC amplitude of the surface ECGs and HV lead EGMs can be changed in the PVC Amplitudes dialog.

6 rPVC
These two buttons create premature right ventricular contractions. The right PVC amplitude of the surface ECGs and HV lead EGMs can be changed in the PVC Amplitudes dialog.

Current State



1 Current Atrial Rate
This value shows the current intrinsic or paced atrial rate.

2 Current Ventricular Rate
This value shows the current intrinsic or paced ventricular rate.

The pace displays show the measured voltage and pulse width. The color of the display changes to black for about 0.5 s for a currently delivered pulse.
The active electrodes are placed in the parenthesis (1-4, R, Sh). For unipolar left ventricular pacing, only the cathode will be displayed.

- u: unipolar
- b: bipolar
- 1: LV Tip 1
- 2: LV Ring 2
- 3: LV Ring 3
- 4: LV Ring 4
- Sh: Shock Coil
- R: RV Ring

3 Most Recent Atrial Pace Values
This entry shows voltage and duration of the most recent atrial pace.

4 Most Recent Right Ventricular Pace Values
This entry shows voltage and duration of the most recent right ventricular pace.

5 Most Recent Left Ventricular Pace Values
This entry shows voltage and duration of the most recent left ventricular pace. It is only visible for biventricular and quadripolar devices.
The active electrodes are placed in the parenthesis (1-4, R, Sh). For unipolar pacing, only the cathode will be displayed.

6 Most Recent Second Left Ventricular Pace Values (MPP)
This entry shows voltage and duration of the second left ventricular pace for MPP devices. It is only visible for quadripolar devices and shows the second pace in case of multipoint pacing.
The active electrodes are placed in the parenthesis (1-4, R, Sh). For unipolar pacing, only the cathode will be displayed.

7 Most Recent Shock Values
This entry shows energy and polarity at RV coil of the most recent shock event. The polarity + or - indicates whether the shock started with a positive or negative voltage at RVcoil.

Exercise

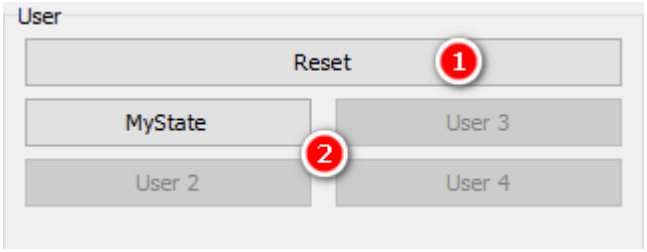
Use checkbox and trackbar to manually control the simulated exercise of the virtual patient.

1 Auto Sinus & PR
If the box is checked, the simulator controls sinus rate, PR interval, and QT time relative to the selected workload.

2 Workload
Use the trackbar to select the workload for the virtual patient.

See also Status Bar, Exercise dialog, Chronotropic Incompetence.

User

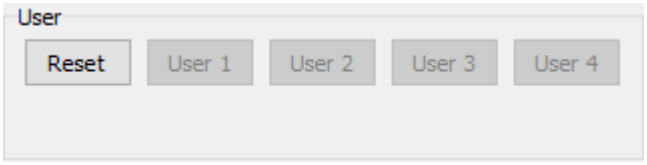


1 Reset
Resets all parameters to default values. See also the Reset menu item and the Reset Values.

2 User Buttons

Use the User Buttons for quick access to frequently used States or Macros. Create these states via Save Simulation State or the Macros via Save Macro. Apply the States or Macros via Assign User Buttons.

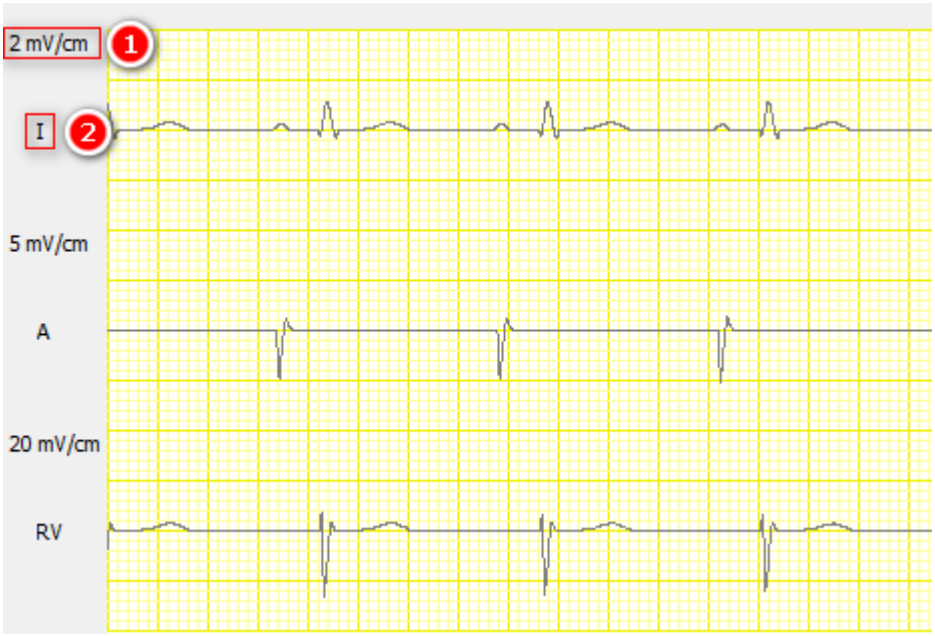
If the space on the screen is limited, the User group can also appear with buttons reduced in size.



ECG

Watch the simulated ECGs or EGMs in the ECG display.

ECG Display

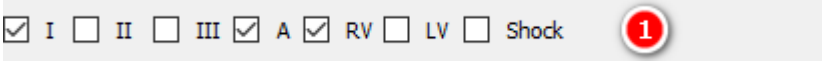


1 Amplification
Shows the amplification of the assigned ECG trace. Adjust all amplifications with the button Normalize.

2 Lead
Shows the lead of the assigned ECG trace. Select the visible traces by checking the boxes below the ECG.

 Two squares are the equivalent to 1 cm.

Traces



1 List of available ECG Traces
Select the desired traces in the ECG area. At least one trace must be selected.

The available traces depend on the selected Device Type.

- Dual Chamber

  ☑ I ☑ II ☑ III ☑ A ☑ RV ☑ Shock

- Biventricular, Quadripolar

  ☑ I ☑ II ☑ III ☑ A ☑ RV ☑ LV ☑ Shock

- SICD

  ☑ I ☑ II ☑ III ☑ Pri ☑ Sec

- Temporary/External

  ☑ I ☑ II ☑ III ☑ A ☑ RV

- Conduction System Pacing

  ☑ I ☑ II ☑ III ☑ A ☑ LV ☑ Shk ☑ CS

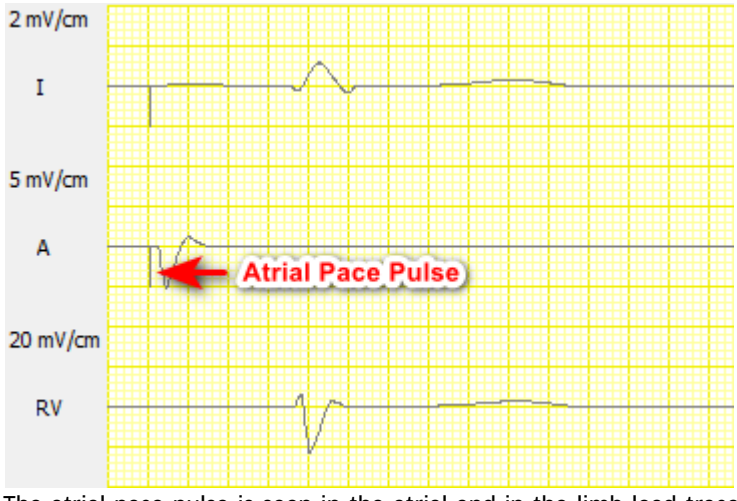
Pace Pulses

☑ Draw Pulses ☐ Draw Cross Pulses

1 2

1 Draw Pulses

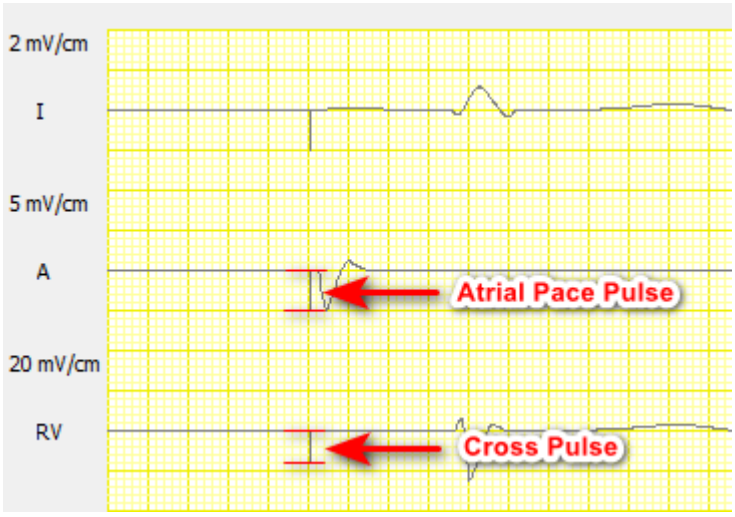
Check this box to see pace pulses in the ECG. Pace Pulses are visible in the limb lead ECGs and in the appropriate intracardiac traces.



The atrial pace pulse is seen in the atrial and in the limb lead traces.

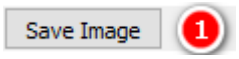
2 Draw Cross Pulses

Check this box to see all pace pulses in each intracardiac trace; an atrial pulse is also drawn in the ventricular traces and vice versa.



The atrial pace pulse is seen as smaller cross pulse in the ventricular trace.

Save Image

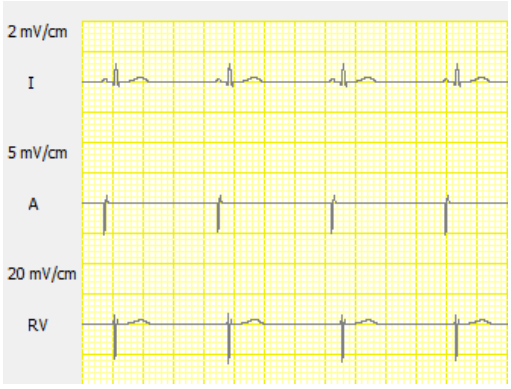


Save Image
Press this button to take a screenshot of the current ECG. After capturing the ECG, a Save ECG Dialog will appear.

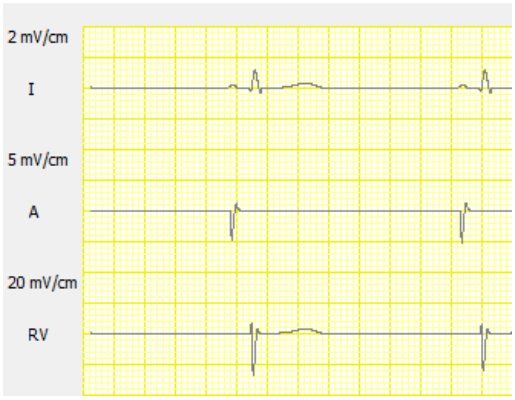
See also Folders.

Settings

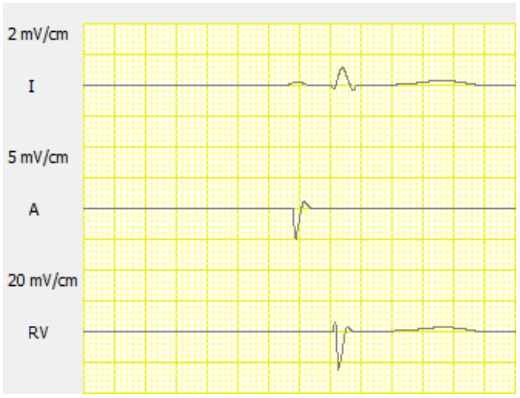
Sweep Speed
Select the sweep speed in the ECG.



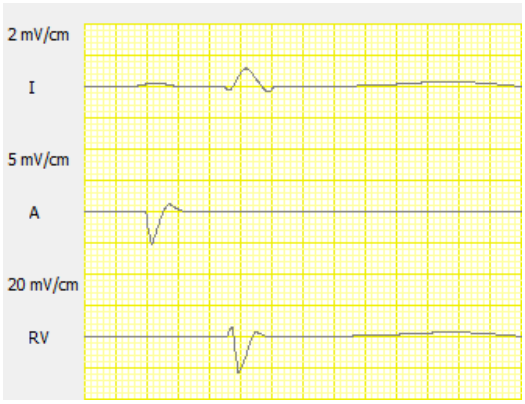
12.5 mm/s



25 mm/s



50 mm/s

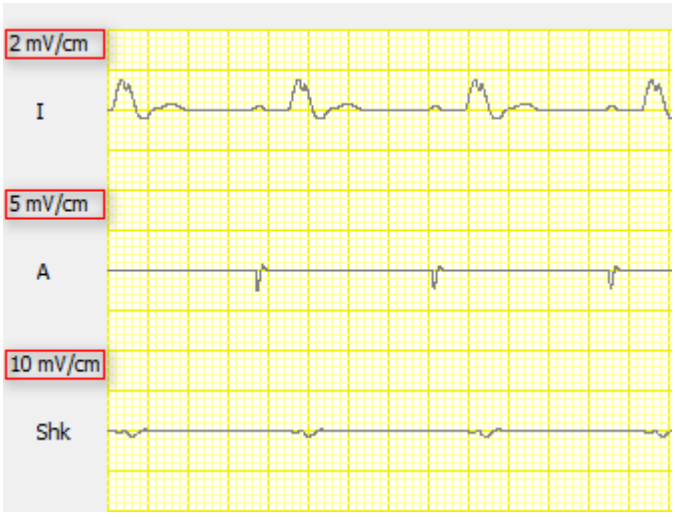


100 mm/s

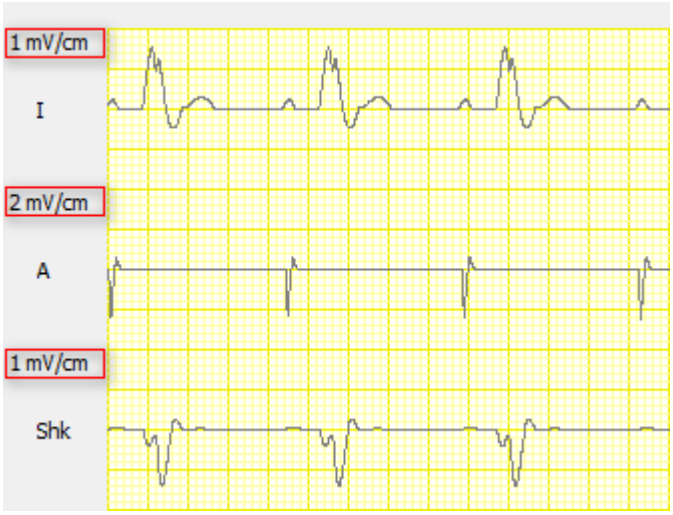
2 Zoom
Use this to select the zoom factor of the ECG. The number of visible ECG traces may be reduced with high zoom factors.

3 Type
Use this to toggle between two ECG views.

4 Normalize
Use this to adjust all trace amplifications.



ECG after setting of atrial and ICD amplitudes

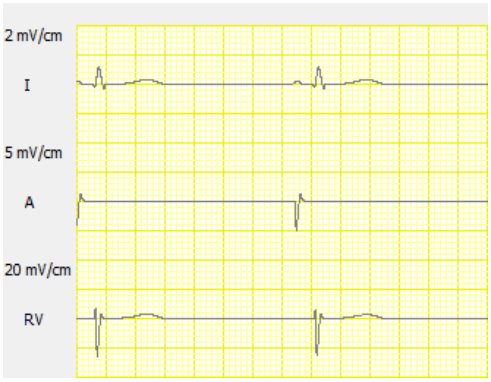


The same ECG after normalizing

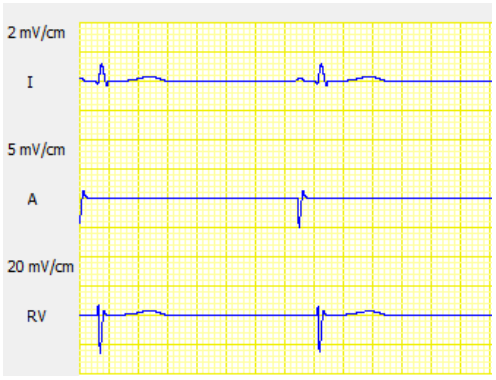
2 squares are the equivalent of 1 cm.

ECG Review

1 Freeze / Continue
Press the Freeze button to go up to 8 minutes back in the ECG. The caption of the button will become "Continue" and the buttons Backward, Refresh, and Forward will be enabled. Press the button Continue to see the real time ECG again. Upon continuation the ECG buffer will be cleared.



ECG is running,



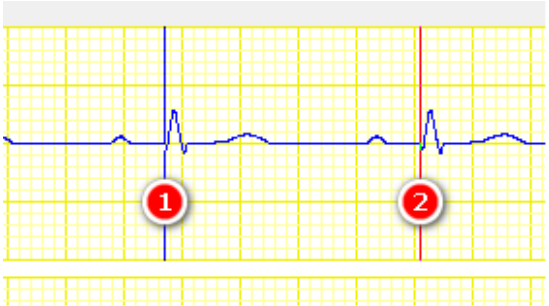
ECG is frozen.

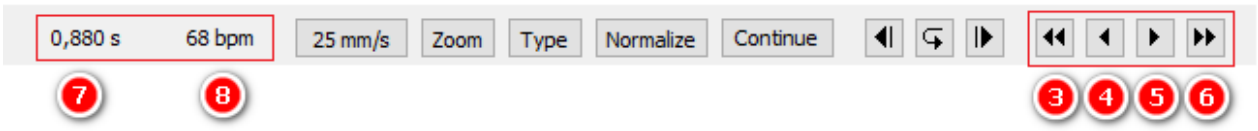
2 Backward
Press the Backward button to move the ECG half a page backward.

3 Refresh
Press the Refresh button if you have changed visible traces, sweep speed, or zoom factor.

4 Forward
Press the Forward button to move the ECG half a page forward.

Cursors





1 Blue Cursor
The blue line represents cursor 1. Click left mouse button to show or move the cursor.

2 Red Cursor
The red line represents cursor 2. Click right mouse button to show or move the cursor.

3 Large Step Left
This moves the cursor a large step left.

4 Step Left
This moves the cursor a small step left.

5 Step Right
This moves the cursor a small step right.

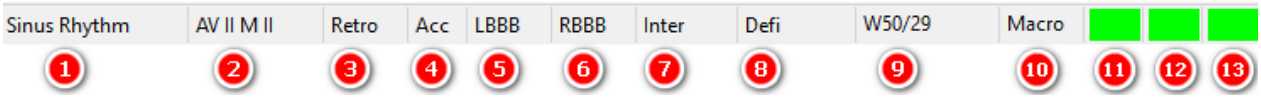
6 Large Step Right
This moves the cursor a large step right.

Click on the step buttons with the left mouse button to move cursor 1 and with the right mouse button to move cursor 2. If you want to use the keyboard, navigate with the TAB key to the appropriate button and use the space bar to move cursor 1 and the "P" key to move cursor 2.

7 Interval between Cursors
If both cursors are visible the interval between them is shown here.

8 Corresponding Rate to Cursor Interval
If both cursors are visible the "rate" associated to this interval (7) is displayed.

Status Bar



1 Rhythm
The currently active rhythm.
If Dual Tachycardia is activated, abbreviations of both rhythms are displayed.

2 AV Block
The currently AV conduction status.

3 Retrograde Conduction
"Retro" if Retrograde Conduction is selected.

4 Accessory Pathway
"Acc" if Accessory Pathway is selected.

5 LBBB
"LBBB" if Left Bundle Branch Block is selected.

6 RBBB
"RBBB" if Right Bundle Branch Block is selected.

"LBBB" and "RBBB" cannot be selected at the same time.


Inter
Displays either "Inter" for Interface or the activated demo device.


Defi
Displays "Defi" when the demo ICD is charging.


Exercise
"W#/#" if Auto Sinus & PR is active.
The first number shows the current workload, the second number the exercise level of the patient as a percentage.
For Example: "W50/43" stands for a current workload of 50% and a current exercise level of 43%.


Macro active
The word "Macro" flashes if a macro is currently running.


Interface Status

- No interface unit available or communication to the interface is compromised.
- The upper half of the field should always be light green if an InterSim III Interface unit is connected. It shows the successfully established connection to the simulator electronics.
- The lower half turns green in case an Adapter Box is connected and recognized. It remains red in case no Adapter Box is connected or the communication between interface and Adapter Box is compromised.


Delay Indicator

- Normal operation, real time simulation available.
- Borderline condition exists for a short period in time.
- Real-time simulation not possible.

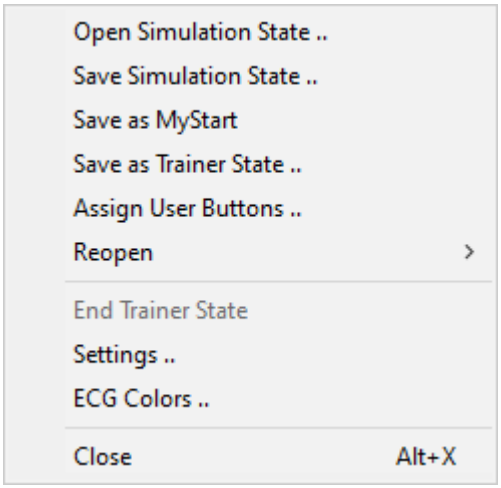

Classroom State

- Classroom functionality enabled. InterSim III is used in classroom mode.
- Connection to local or web classroom server established.
- Classroom Session active.
- Error occurred.

Menus

File

The File menu contains all commands necessary for dealing with Simulation States and some additional system commands.



Open Simulation State

The menu item opens the Open Simulation State Dialog. Select the desired state and click OK. See also Simulation States and Folders.

Save Simulation State

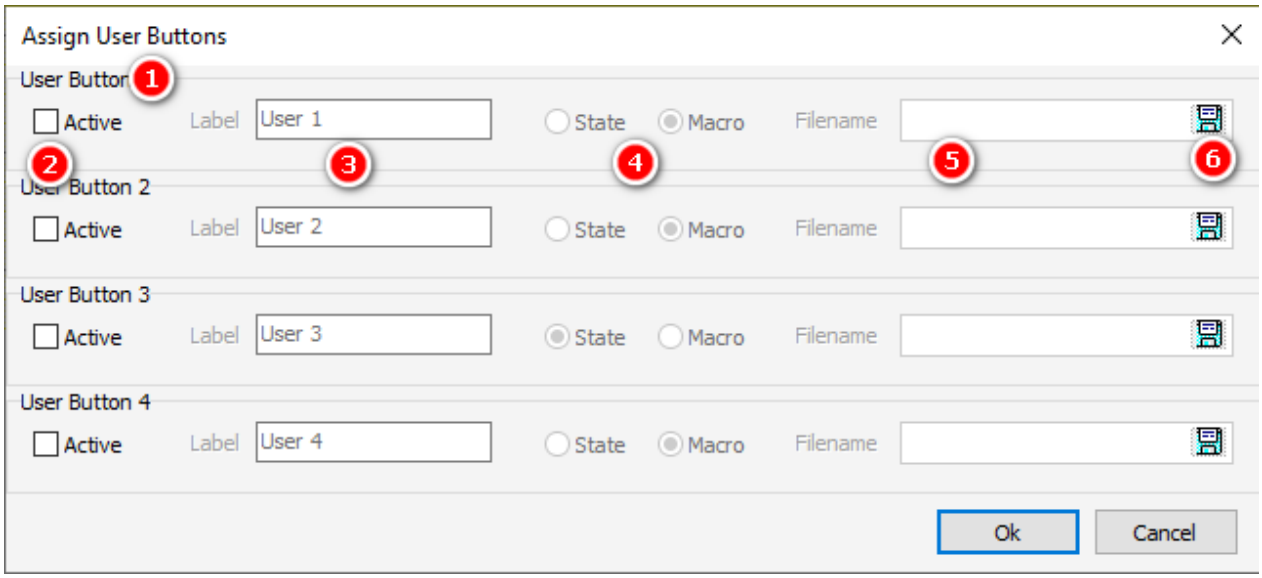
The menu item opens the Save Simulation State Dialog. Enter the filename and click OK to create a new Simulation State. See also Simulation States and Folders.

Save as MyStart

This menu item creates the special MyStart State. If MyStart already exists, a confirmation dialog will appear. See also Simulation States and Folders.

Assign User Buttons

Use User Buttons for quick access to commonly used Simulation States or Macros. This dialog lets you assign appropriate States or Macros.



1 User Button 1-4
Select the User Button to which the State or Macro should be assigned.

2 Active
Select whether the User Button should be active or not.

3 Label
Enter the Label that should appear on the User Button.

4 State/Macro
Choose State or Macro depending on what you want to assign.

5 Filename
This control shows the selected file.

6 Disc symbol
Press the disc symbol to select the file you want to assign to the User Button.

See also Simulation States, Macros, and Folders.

Save as Trainer State

A Simulation State can be saved as Trainer State. See also Simulation States and Folders.

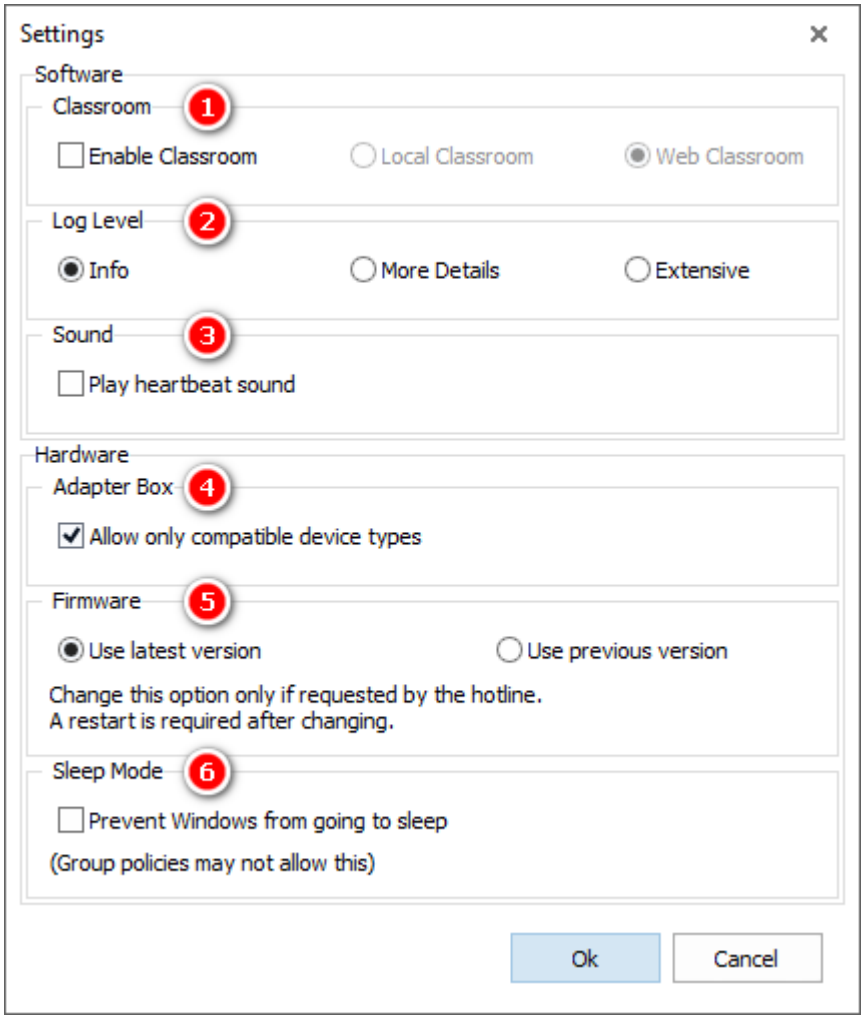
Reopen

Click Reopen to open the list of recently saved or loaded state files. Click the filename of the state you want to load again.

End Trainer State

A Trainer State allows only access to a limited set of parameters. Use this menu item to return to normal operation. The menu item is disabled if no Trainer State is loaded.

Settings



1 Classroom
InterSim can work in a classroom configuration. Check this box to enable the classroom functionality. Choose the Local or Web Classroom based on your existing configuration.

2 Log Level
It is possible to have more comprehensive information in the journal file. At startup, a message window indicates a higher log level.

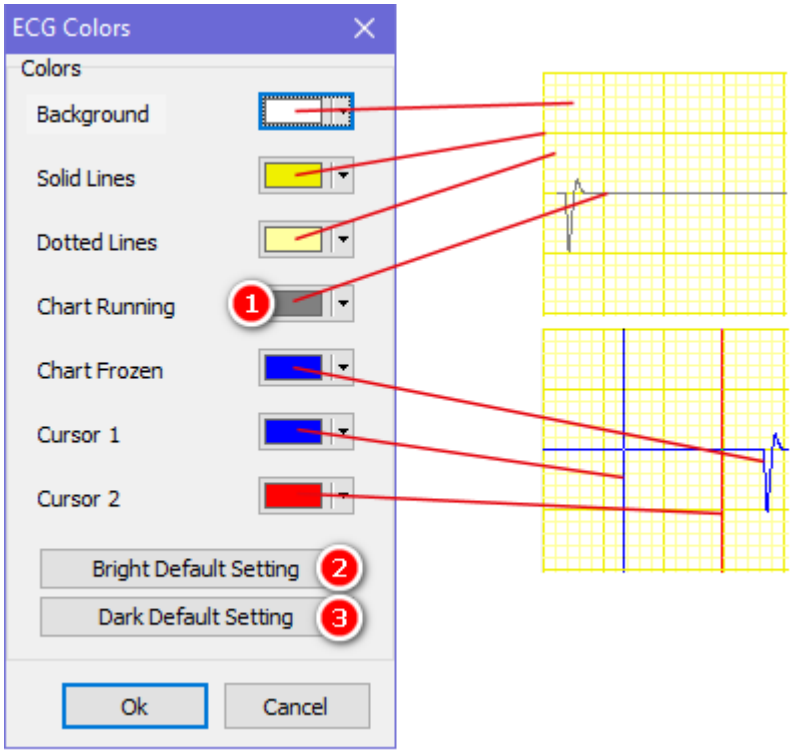
3 Sound
Check this box to play available heartbeat sounds.

4 Adapter Box
Depending on the Adapter Box (Standard, Extended) and High Voltage Adapter (DF-1, DF-4) used, some functions may not be available. If you do not want this behavior, uncheck this box.

5 Firmware
The simulator stores up to two different firmware versions. By default the latest version is loaded at simulator start-up. In case of problems, the hotline may ask you to load the previous version.

6 Sleep Mode
When the PC is going to sleep, the application will stop. A connected ICD could misinterpret this as fibrillation. When this checkbox is checked, the application tries to prevent Windows from sleep.

ECG Colors



1 Color Buttons
Use these buttons to define the different colors of the ECG. The image shows the assignment of the buttons to the different ECG parts.

2 Bright Default Settings
Press this button if you want to restore the default bright color assignment.

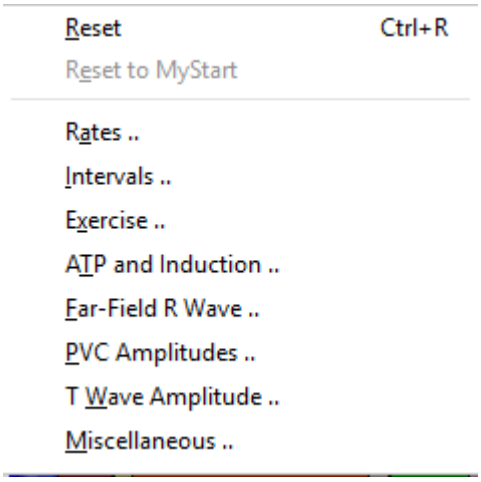
3 Dark Default Settings
Press this button if you want to restore the default dark color assignment.

Close

Use this menu item to close the application. If the macro window contains a changed and unsaved macro, a confirmation dialog appears before closing.

Parameters

The Parameters menu contains settings that primarily control rates and timing. The values selected in the dialogs will be applied by pressing the OK button. The selected values will be discarded by pressing the Cancel button.



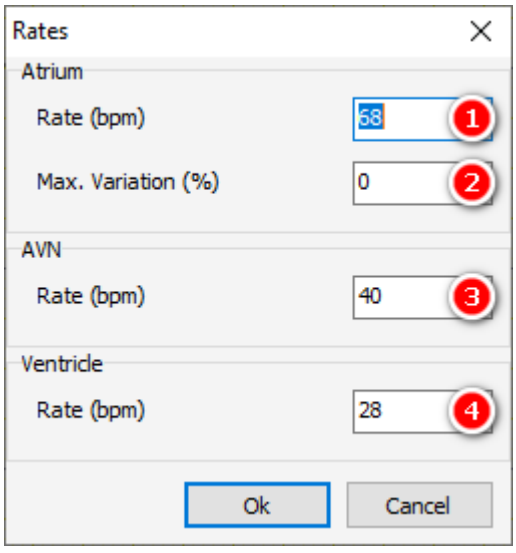
Reset

Resets all parameters to default values. See also the Reset button and the Reset Values.

Reset to MyStart

The MyStart State is a special state that is automatically loaded at program startup. Use this menu entry to return to this state at any time. See also Simulation States.
It is also possible to assign the Mystart state to a user button.

Rates



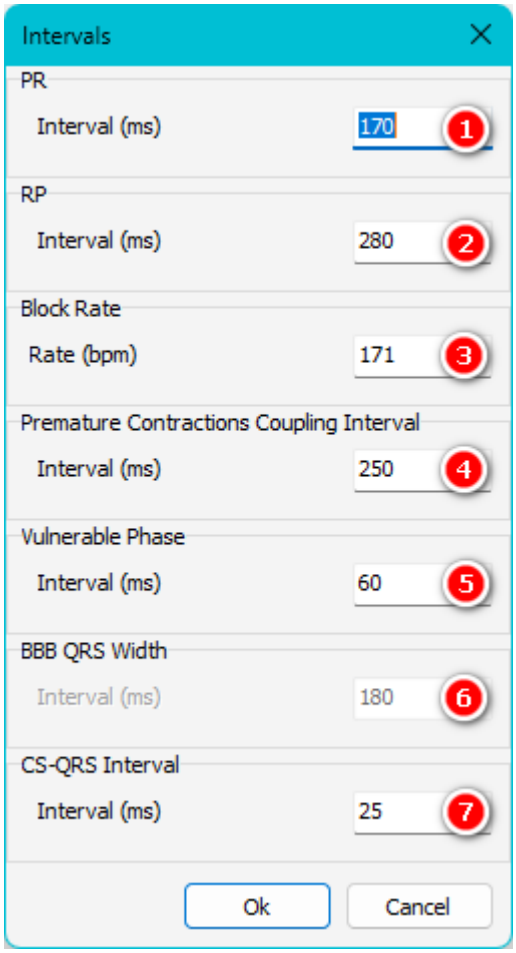
1 Atrial Rate
Use this to set the intrinsic sinus node rate. Note that this value will only take effect if the checkbox "Auto Sinus & Auto PR Interval" is not selected. Otherwise the simulator will control the atrial rate. The range is from 2 bpm to 245 bpm.

2 Max. Variation
Use this to define the maximum variation of the sinus node rate. The range is from 0% to 20%.

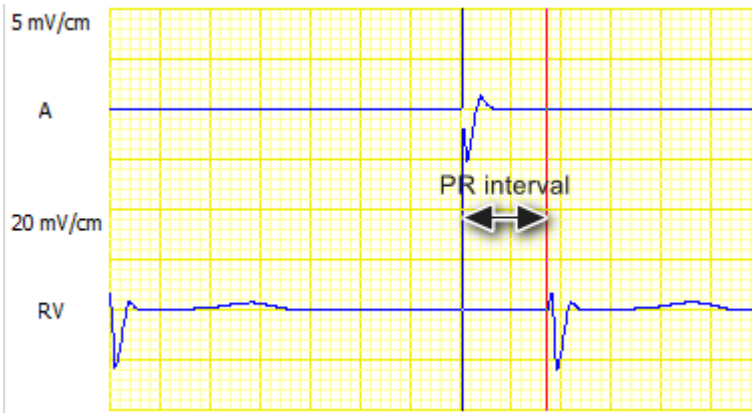
3 AVN Rate
Use this to set the intrinsic AV node escape rate. The range is from 2 bpm to 200 bpm.

4 Ventricular Rate
Use this to set the intrinsic ventricular escape rate. The range is from 2 bpm to 250 bpm.

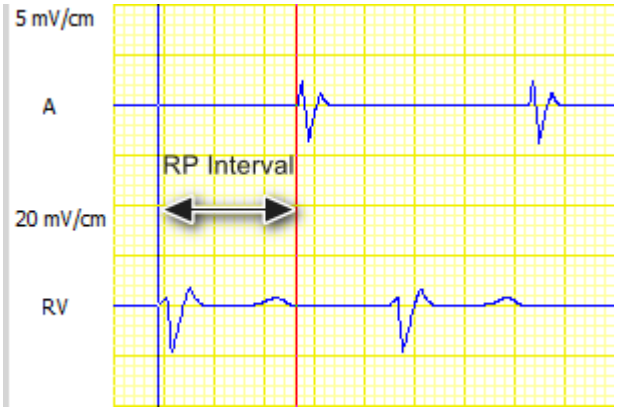
Intervals



1 PR Interval
Use this to set the interval between the intra-atrial P wave and the intraventricular R wave in case of 1:1 conduction. Note that this value will only take effect if the checkbox "Auto Sinus & Auto PR Interval" is not selected. Otherwise the simulator will control the PR Interval. The range is from 50 ms to 400 ms.

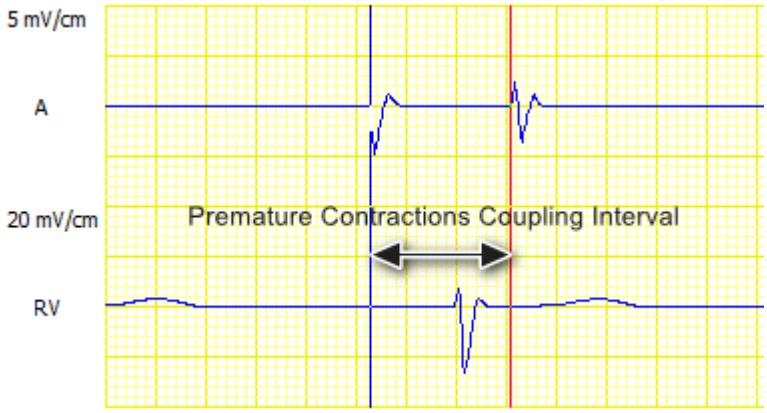


2 RP Interval
If the retrograde conduction is enabled, use this to set the RP interval. The range is from 130 ms to 600 ms.

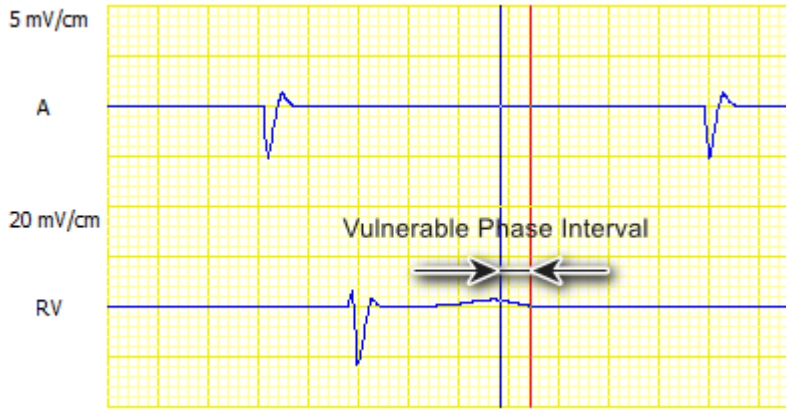


3 AVN Block Rate
Use this to set the block rate of the atrioventricular conduction (Wenckebach point). The range is from 20 bpm to 250 bpm.

4 Premature Coupling Interval
Use this to set the coupling interval of premature contractions. This value will be effective on premature contractions which are triggered by means of the left row of the premature buttons. The range is from 100 ms to 1000 ms.



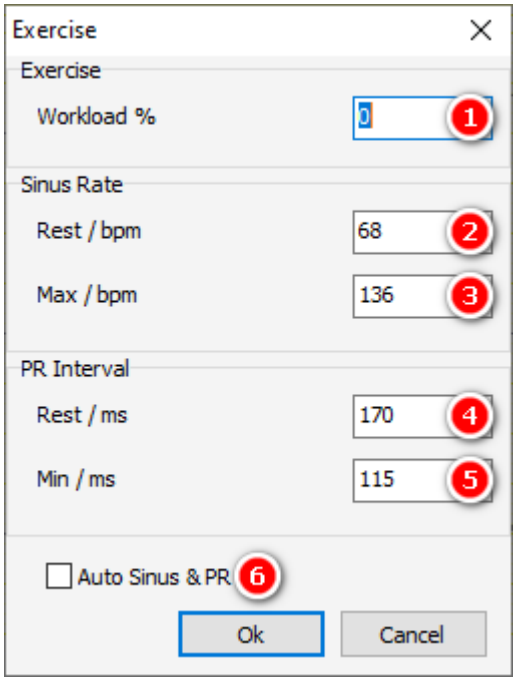
5 Vulnerable Phase Interval
This parameter applies to the initiation and termination of tachyarrhythmias. It determines the width of the vulnerable phase at the end of the refractory period of the atria and the ventricles. The range is from 40 ms to 80 ms.



6 BBB QRS Width
If LBBB or RBBB is active, use this to set the QRS width. The range is from 80 ms to 220 ms.

7 CS-QRS Interval
Use this to set the interval between the conduction system signal and the QRS complex. The range is fro 16 ms to 35 ms.

Exercise



1 Current Workload in %
If the Auto Checkbox is checked, the patient's exercise level increases or decreases to meet the value of the workload. The exercise level in turn determines Sinus Rate and PR Interval. The range is from 0 to 100%.

2 Sinus Rest Rate
The Sinus Rest Rate is the rate at an exercise level of 0%. The range is from 0 to 245 bpm.

3 Max Sinus Rate
The Max Sinus Rest Rate is the rate at an exercise level of 100%. The range is from 0 to 245 bpm.

The Sinus Rest Rate cannot be set to a higher value than the Max Sinus Rate.

4 PR Rest Interval
The PR Rest Interval is the interval at an exercise level of 0%. The range is from 50 to 400 ms.

5 Min PR Interval
The Min PR Interval is the interval at an exercise level of 100%. The range is from 50 to 400 ms.

The PR Rest Interval cannot be set to a lower value than the Min PR Interval.

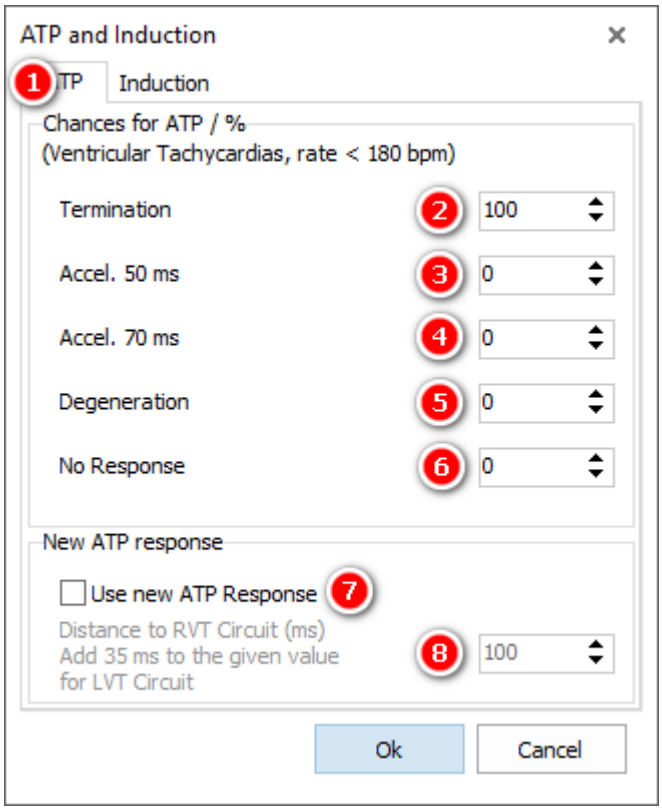
6 Auto Sinus & PR
If the Auto Checkbox is checked, Sinus Rate and PR Interval are set automatically by the simulator. If the box is unchecked, the values are determined by the appropriate controls.

ATP and Induction

Chances determine the result of an ATP or Induction.

ATP

Chances for ATP determine the result of an ATP while a sinus tachycardia < 180 bpm or a ventricular tachycardia < 182 bpm is active. The sum of the chances must be 100%. Follow a top-down direction while entering new values.



1 ATP
Select this Tab to edit the Chances for ATP.

2 Termination
Sets the chance of termination of a tachycardia.

3 Acceleration 50 ms
Sets the chance of acceleration of a tachycardia by 50 ms.

4 Acceleration 70 ms
Sets the chance of acceleration of a tachycardia by 70 ms.

5 Degeneration
Sets the chance a tachycardia will degenerate to a fibrillation.

6 No Response
Sets the chance that the virtual patient does not response to an ATP.

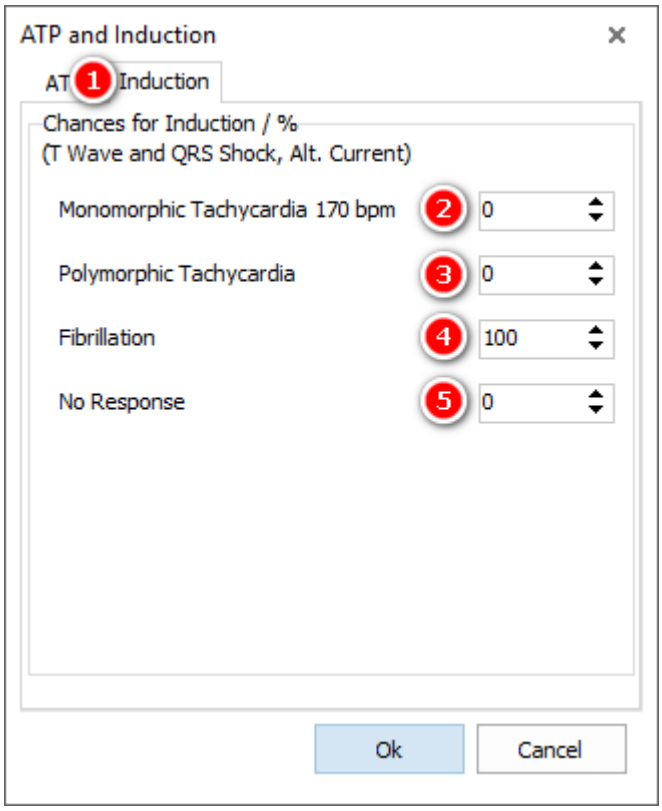
7 Use new ATP Responde

Select this checkbox to use a new variant to end an ATP.

8 Distance to RVT Circuit (ms)
This is the distance to the right ventricular tachycardia circuit in ms. You need the corresponding number of S1 pulses to bridge this distance. The subsequent S2 pulse must be coupled with 76% to 80% of the tachy interval to end the tachycardia.
Add 35 ms if you use a left ventricular tachycardia.

Induction

Chances for Induction determine the result of an induction like T wave shock, QRS shock, DC Fibber, or alternating current while a sinus rhythm is active. Note that the sum of the chances must be 100%. Follow a top-down direction while entering new values.



1 Induction
Select this Tab to edit the Chances for Induction.

2 Monomorphic Tachycardia 170 bpm
Sets the chance of induction of a Monomorphic Tachycardia.

3 Polymorphic Tachycardia
Sets the chance of induction of a Polymorphic Tachycardia.

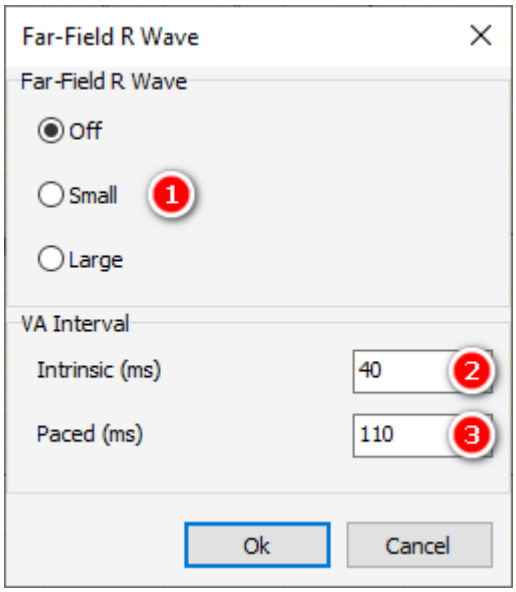
4 Fibrillation
Sets the chance of induction of a Ventricular Fibrillation.
This is the standard behavior (100 %).

5 No Response

Sets the chance that the virtual patient does not response to an Induction.

Far-Field R Wave

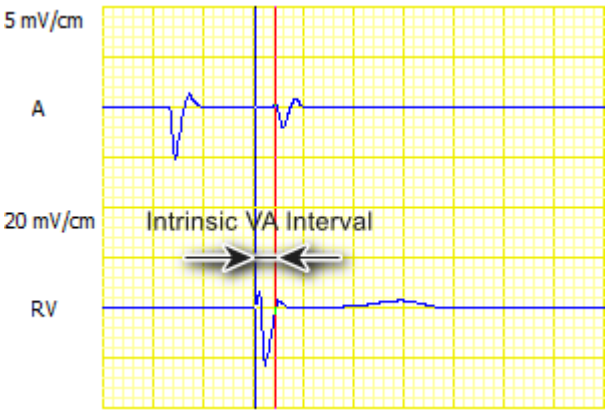
The settings of the Far-Field R Wave dialog control the appearance and delay of R waves in the atrial channel.



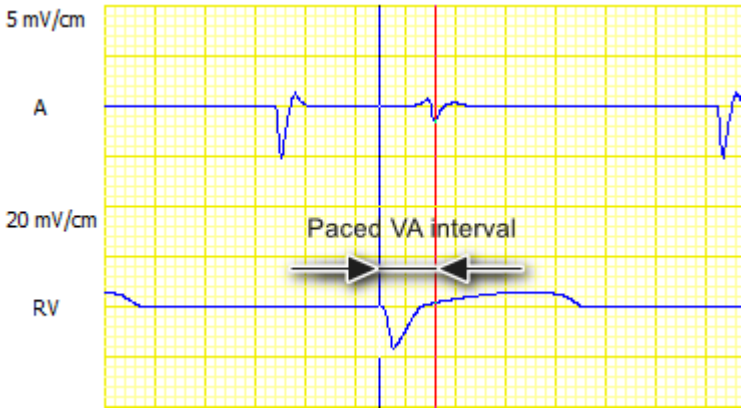
1 Far-Field R Wave shape
Use this to set the shape of Far-Field R Waves.

- Off: no Far-Field R Wave in the atrial channel
- Small: a small Far-Field R wave appears in the atrial channel
- Large: a large Far-Field R wave appears in the atrial channel

2 Delay of intrinsic Far-Field R Waves
Determines the delay of a Far-Field R Wave to an intrinsic R wave. The range is from 0 to 100 ms.
The interval is specified from the beginning of the QRS complex to the beginning of the Farfield signal.

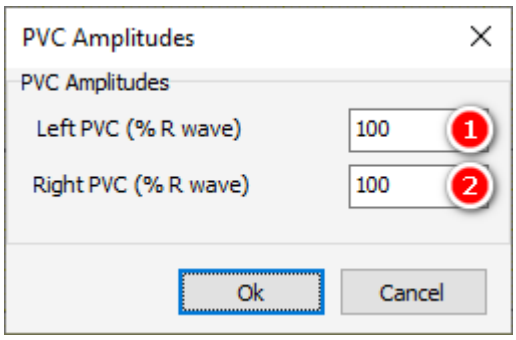


3 Delay of paced Far-Field R Waves
Determines the delay of a Far-Field R Wave to a paced R wave. The range is from 50 to 200 ms.
The interval is specified from the pace pulse to the R-peak.



PVC Amplitudes

The settings of the PVC Amplitudes dialog control the amplitudes of left and right ventricular premature contractions. This way, it is possible to show an undersensing of a R wave following a PVC.



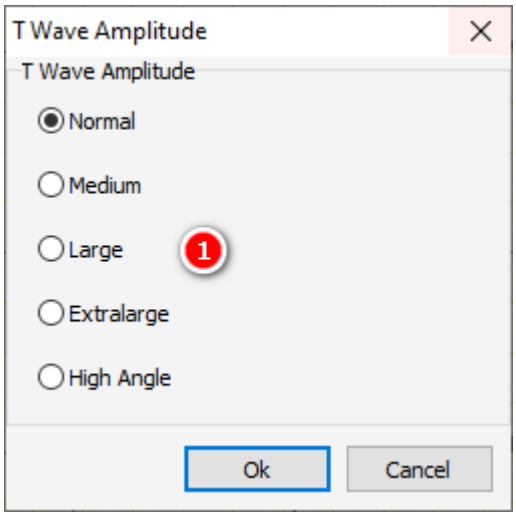
1 Left PVC Amplitude
Use this to set the left PVC amplitude of the surface ECGs and HV lead EGMs as percentage of the R wave amplitude. The range is from 50% to 300%.

2 Right PVC Amplitude
Use this to set the right PVC amplitude of the surface ECGs and HV lead EGMs as percentage of the R wave amplitude. The range is from 50% to 300%.

See also how premature contractions are created.

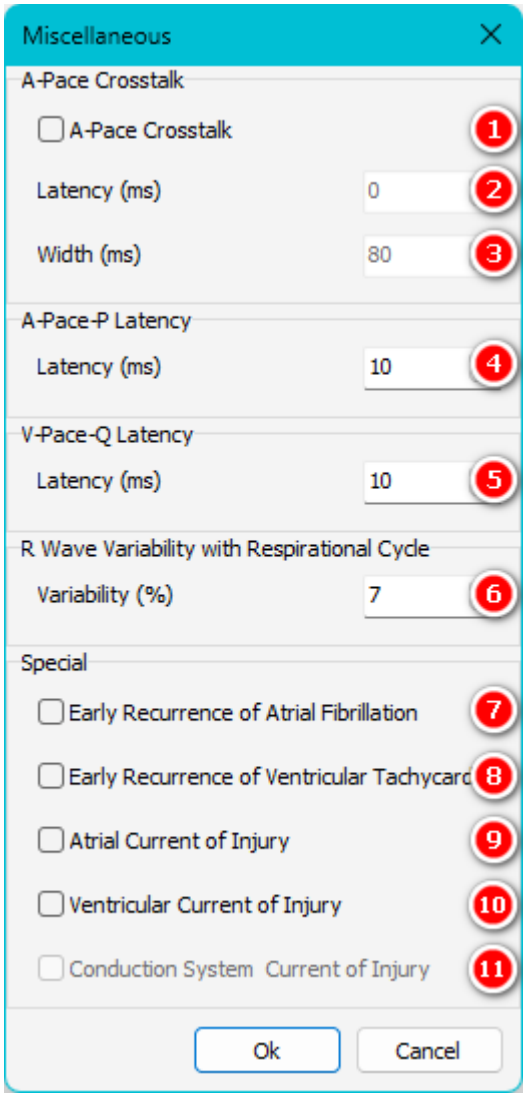
T Wave Amplitude

The settings in the Amplitude T Wave dialog control the appearance of the T waves in the intraventricular and shock channels.



1 T Wave Amplitude
Use this to set the amplitude of the T wave.
High Angle is especially intended to show T wave oversensing.

Miscellaneous



 A-Pace Crosstalk
This parameter is intended to demonstrate ventricular safety pacing that occurs if the pacemaker discovers any interference in the ventricular IEGM during the AV interval. If A-pace Crosstalk is checked in the Parameters menu, a large crosstalk signal appears in the ventricular IEGM.

 A-Pace Crosstalk Latency
Use this to set the latency of the A-Pace Crosstalk signal. The range is from 0 ms to 50 ms.

 A-Pace Crosstalk Width
Use this to set the width of the A-Pace Crosstalk signal. The range is from 5 ms to 100 ms.

 A-Pace-P Latency
Use this to set the latency between the delivery of the atrial stimulus and the resultant atrial excitation. The range is from 1 ms to 150 ms.

 V-Pace-Q Latency
Use this to set the latency between the delivery of the ventricular stimulus and the resultant ventricular excitation. The range is from 1 ms to 150 ms.

 R Wave Variability with Respirational Cycle
Use this to set the variability of the R wave amplitude with the respirational cycle. The range is from 0% to 40%.

 ERAF
By means of this box the ERAF phenomenon (Early Recurrence of AF) can be shown.
Procedure:

- select ERAF
- choose atrial fibrillation
- terminate the atrial fibrillation, for example manually
- without pacing the atrial fibrillation will recur after a while
- with pacing (> 80 bpm) the atrial fibrillation will not recur

 ERVT
By means of this menu item the ERVT phenomenon (Early Recurrence of VT) can be shown.
Procedure:

- select ERVT
- choose ventricular fibrillation
- terminate the ventricular fibrillation, for example manually
- without pacemaker interaction the ventricular fibrillation will recur after a while
- with pacemaker interaction (> 80 bpm) the ventricular fibrillation will not recur

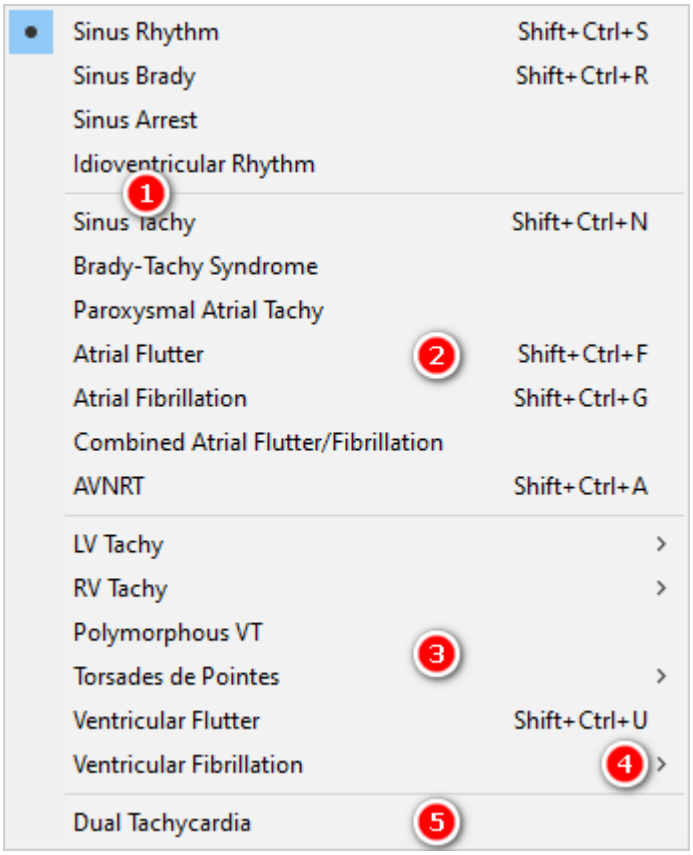
 Atrial Current of Injury
Select this checkbox to demonstrate an atrial current of injury. The Current of Injury decreases over time and switches off automatically after 5 minutes.

 Ventricular Current of Injury
Select this checkbox to demonstrate a right ventricular current of injury. The Current of Injury decreases over time and switches off automatically after 5 minutes.

 Conduction System Current of Injury
Select this checkbox to demonstrate a conduction system current of injury. The Current of Injury decreases over time and switches off automatically after 5 minutes.

Rhythms

The Rhythms Menu provides the different heart rhythms.



1 List of predefined rhythms
Select a rhythm from the list.

2 List of atrial tachycardias
The entries of this part of the list, except combined rhythms, can be used for dual tachycardias.

3 List of ventricular tachycardias
This list contains ventricular tachycardias.

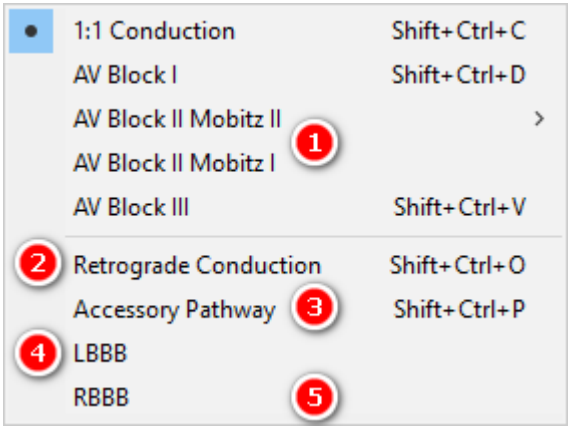
4 Entry that opens a submenu
Entries that open a submenu are indicated by the little arrow on the right.

5 Dual Tachycardia
Some of the atrial and ventricular tachycardic rhythms can be uses in a dual tachycardia. This checkbox enables this behavior.

See also Rhythm Characteristics.

Blocks

The Blocks Menu provides different atrio-ventricular conduction options.



1 List of AV Blocks
Select an AV block from the list.

2 Retrograde Conduction
Use this checkbox to enable the retrograde conduction.

3 Accessory Pathway
Check this box to enable an accessory pathway between the atrium and the upper left ventricle. It is possible to demonstrate a reentry loop.

4 LBBB
Use this checkbox to establish a Left Bundle Branch Block.

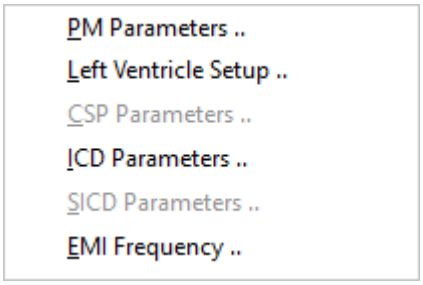
5 RBBB
Use this checkbox to establish a Right Bundle Branch Block.

LBBB and RBBB cannot be checked at the same time. See also the RV-LV-Interval in the Left Ventricle Setup Dialog.
See Block Characteristics.

Interface

The Interface menu contains settings that directly control the interaction with pacemakers or ICDs.
Apply the settings of the Interface dialogs with the Apply button. Refresh the settings with the Refresh button. This is useful when settings have changed, for example by loading a state or running a macro. Close the window with the Close Button. You can leave the Interface dialogs open and open another dialog window.

The Left Ventricle Setup menu item is enabled when a bipolar or quadripolar device type is selected.
The SICD Parameters menu item is enabled when a SICD device type is selected.



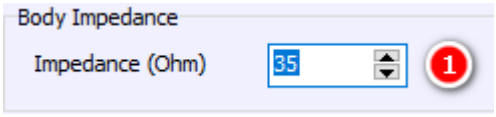
PM Parameters

Use this to set the parameters for a pacemaker. This menu item is disabled when a SICD device type is selected.

See the Left Ventricle Setup to set impedances, thresholds, RV-LV intervals, amplitudes, and EMI of the left ventricle.

Body Impedance

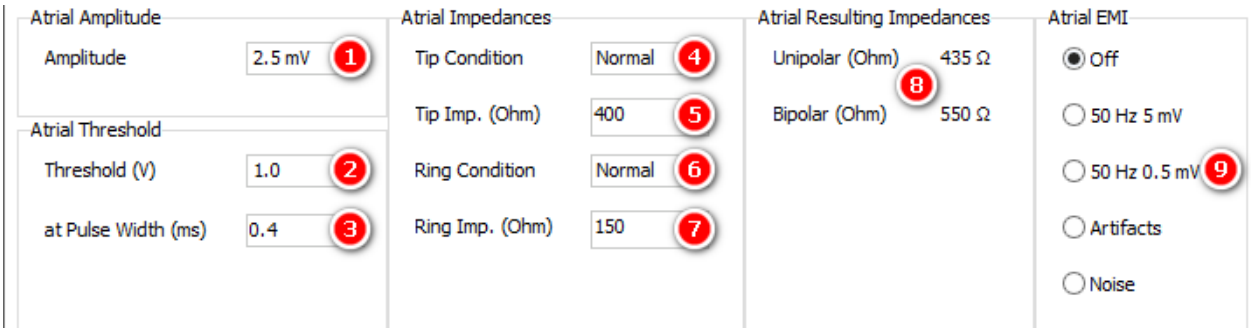
The annotated picture is part of the PM_Parameters_Dialog.



1 Body Impedance
Use this to set the Body Impedance. The Body Impedance affects every unipolar pacemaker impedance. Possible values are 15 Ω to 45 Ω. See Impedances.

Atrial Parameters

The annotated picture is part of the PM_Parameters_Dialog.
The simulator uses strength-duration curves for threshold calculation.
Click link to learn more about how to calculate impedances.



1 Atrial Amplitude
Use this to set the maximal intra-atrial amplitude during sinus rhythm. The range is from 0.15 mV to 6.0 mV.
If a Temporary/External Device Type is selected, the range expands to 0.15 mV to 25.0 mV.

2 Atrial Threshold Voltage
Use this to set the threshold voltage of the atrial channel. The range is from 0.5 V to 3.75 V. Use n.c. if you do not want to have capture at all.
If a Temporary/External Device Type is selected, the range expands to 0.5 V to 8.0 V.
If Temporary/External Device Type and mA Thresholds are selected, the range changes to 0.1 mA to 20 mA.

3 Pulse Width (ms)
Use this to set the threshold pulse width of the atrial channel. The range is from 0.1 ms to 1.5 ns.

Threshold voltage and pulse width form the chronaxie point of the strength-duration curves.

4 Atrial Tip Defect Condition
Use this to set an electrode defect of the atrial tip strand. Possible values are Normal, Fracture, Leakage, Scar.

5 Atrial Tip Strand Impedance
For a normal condition, use this to set the impedance of the atrial tip strand. The range is from 150 Ω to 500 Ω.

6 Atrial Ring Defect Condition

Use this to set an electrode defect of the atrial ring strand. Possible values are Normal, Fracture, Leakage.

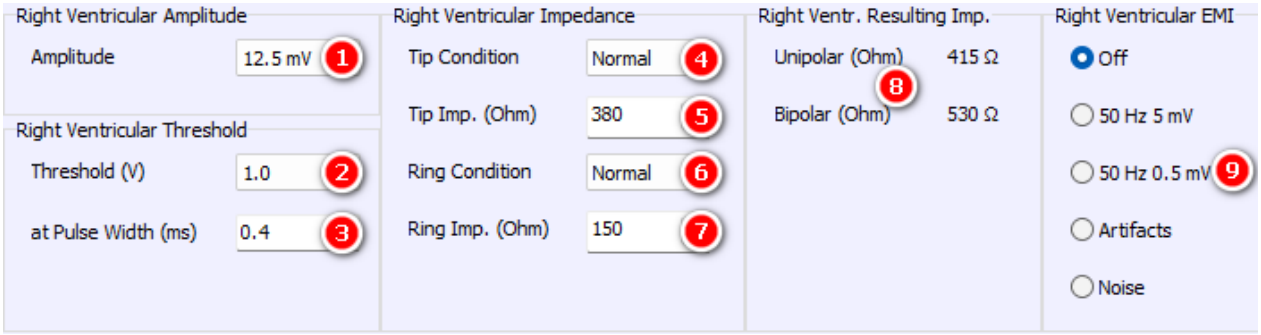
7 Atrial Ring Strand Impedance
For a normal condition, use this to set the impedance of the atrial ring strand. The range is from 150 Ω to 500 Ω.

8 Atrial Resulting Impedance
This panel displays the resulting impedances of the atrial channel.

9 Atrial EMI
Use this to set the EMI of the atrial channel. Use the EMI Frequency dialog to select 50 Hz or 60 Hz.

Right Ventricular Parameters

The annotated picture is part of the PM Parameters Dialog.
The simulator uses strength-duration curves for threshold calculation.
Click link to learn more about how to calculate impedances.



1 Right Ventricular Amplitude
Use this to set the maximal right intraventricular amplitude during sinus rhythm. The range is from 1 mV to 15.0 mV.
If a Temporary/External Device Type is selected, the range expands to 1 mV to 25.0 mV.

2 Right Ventricular Threshold
Use this to set the threshold value of the right intraventricular channel. The range is from 0.5 V to 3.75 V. Use n.c. if you do not want to have capture at all.
If a Temporary/External Device Type is selected, the range expands to 0.5 V to 8.0 V.
If Temporary/External Device Type and mA Thresholds are selected, the range changes to 0.1 mA to 20 mA.

3 Pulse Width (ms)
Use this to set the threshold pulse width of the atrial channel. The range is from 0.1 ms to 1.5 ns.

Threshold voltage and pulse width form the chronaxie point of the strength-duration curves.

4 Right Ventricular Tip Defect Condition
Use this to set an electrode defect of the right intraventricular tip strand. Possible values are Normal, Fracture, Leakage, Scar.

5 Tip Strand Impedance Right Ventricle
For a normal condition, use this to set the impedance of the right intraventricular tip strand. The range is from 150 Ω to 500 Ω.

6 Right Ventricular Ring Defect Condition

Use this to set an electrode defect of the right intraventricular ring strand. Possible values are Normal, Fracture, Leakage.

7 Right Ventricular Ring Strand Impedance
For a normal condition, use this to set the impedance of the right intraventricular ring strand. The range is from 150 Ω to 500 Ω.

8 Right Ventricular Resulting impedance
This panel displays the resulting impedances of the right intraventricular channel.

9 Right Ventricular EMI
Use this to set the EMI of the right intraventricular channel. Use the EMI Frequency dialog to select 50 Hz or 60 Hz.

mA Thresholds for Temporary Pacemakers

The annotated picture is part of the PM Parameters Dialog.

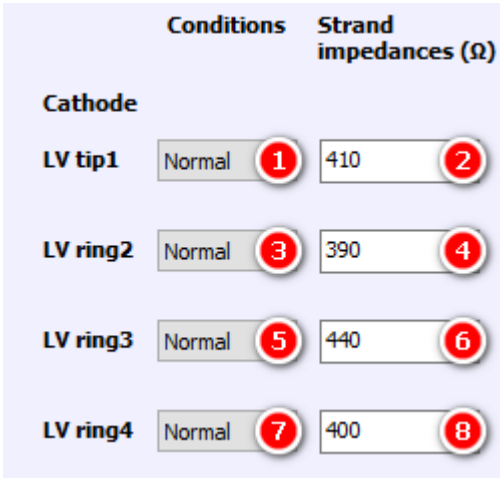
1 Use mA Thresholds for Temporary Pacemakers
Some temporary/external pacemakers work with current thresholds instead of voltage thresholds. Use this setting to switch between voltage and current thresholds.

Left Ventricle Setup

All settings for the left ventricle are accessible via the Left Ventricle Setup in the Interface Menu. This menu item is enabled when a biventricular or a quadripolar device type is selected.

Impedances (LV)

The annotated picture is part of the Left Ventricle Setup Dialog. The cathodes LV ring3 and ring4 are disabled for biventricular devices.
See impedances for instructions on calculating impedances. The resulting impedances are shown in the threshold matrix.



1 LV Tip1 Defect Condition
Use this to set an electrode defect of the left ventricular tip 1 strand. Possible values are Normal, Fracture,

Leakage.

2 LV Tip1 Strand Impedance
For a normal condition, use this to set the impedance of the left ventricular tip 1 strand. The range is from 150 Ω to 500 Ω.

3 LV Ring2 Defect Condition
Use this to set an electrode defect of the left ventricular ring 2 strand. Possible values are Normal, Fracture, Leakage.

4 LV Ring2 Strand Impedance
For a normal condition, use this to set the impedance of the left ventricular ring 2 strand. The range is from 150 Ω to 500 Ω.

5 LV Ring3 Defect Condition
Use this to set an electrode defect of the left ventricular ring 3 strand. Possible values are Normal, Fracture, Leakage.

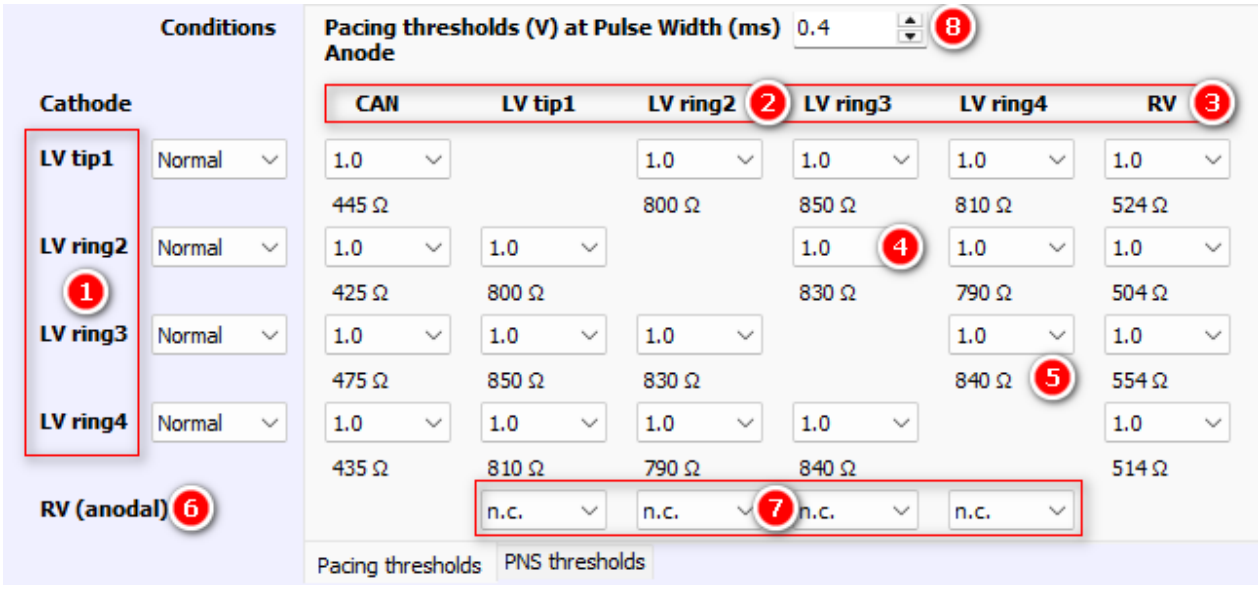
6 LV Ring3 Strand Impedance
For a normal condition, use this to set the impedance of the left ventricular ring 3 strand. The range is from 150 Ω to 500 Ω.

7 LV Ring4 Defect Condition
Use this to set an electrode defect of the left ventricular ring 4 strand. Possible values are Normal, Fracture, Leakage.

8 LV Ring4 Strand Impedance
For a normal condition, use this to set the impedance of the left ventricular ring 4 strand. The range is from 150 Ω to 500 Ω.

Pacing Thresholds (LV)

The annotated picture is part of the Left Ventricle Setup Dialog. The cathodes and anodes LV ring3 and ring4 are disabled for biventricular devices.
The simulator uses strength-duration curves for threshold calculation.



1 Cathodes for Threshold Voltage Matrix
Each threshold voltage raw corresponds to a cathode.

2 Anodes for Threshold Voltage Matrix
Each threshold voltage column corresponds to an anode.

3 RV Anode
The RV column stands for two different anodes. For pacemakers and CRT-Ps, it refers to the anode RV ring. For CRT-D devices, it refers to the RV coil.

4 LVRing2-LVRing3 Threshold Voltage
This is an example how to read the matrix. This specific value is the threshold voltage for the LV ring2 cathode and the LV ring3 anode.

5 LVRing3-LVRing4 Resulting Impedance
The resulting impedances are also displayed in the matrix. The example shows the resulting impedance between LV ring3 and LV ring4.

6 Anode for Anodal Stimulation
RV is always the anode for Anodal Stimulation.

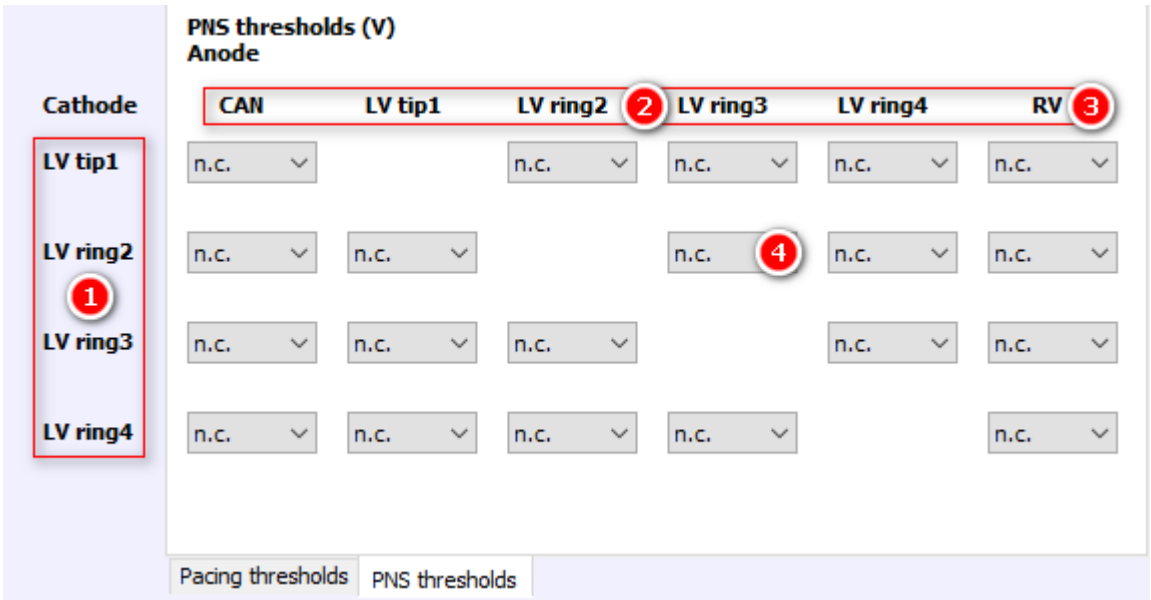
7 Cathodes for Anodal Stimulation
Each threshold voltage column corresponds to a cathode for Anodal Stimulation.

8 Pulse Width (ms)
The pulse width refers to all pacing thresholds in this dialog.

Threshold voltage and pulse width form the chronaxie point of the strength-duration curves.

PNS Thresholds (LV)

The annotated picture is part of the Left Ventricle Setup Dialog. The cathodes and anodes LV ring3 and ring4 are disabled for biventricular devices.
Phrenic nerve stimulation is effective if the voltage exceeds the selected value.



1 Cathodes for PNS Threshold Matrix
Each threshold raw corresponds to a cathode.

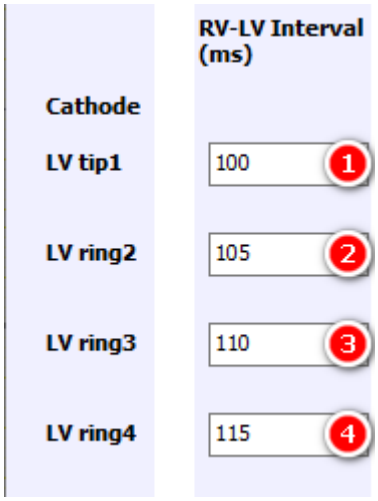
2 Anodes for PNS Threshold Matrix
Each threshold column corresponds to an anode.

3 Anode RV
The RV column stands for two different anodes. For pacemakers and CRT-Ps, it refers to the anode RV ring. For CRT-D devices, it refers to the RV coil.

4 LVRing2-LVRing3 PNS Threshold
This is an example how to read the matrix. This special value is the PNS threshold for the cathode LV ring2 and the anode LV ring3.

RV-LV Interval

The annotated picture is part of the Left Ventricle Setup Dialog. The cathodes LV ring3 and ring4 are disabled for biventricular devices.



1 RV-LV Interval of LV tip1
Use this to set the RV-LV Interval of the left ventricular tip 1 strand. The range is from 10 ms to 160 ms. The default is 100 ms for LBBB and RBBB.

2 RV-LV Interval of LV ring2
Use this to set the RV-LV Interval of the left ventricular ring 2 strand. The range is from 10 ms to 160 ms. The default is 105 ms for LBBB and 95 ms for RBBB.

3 RV-LV Interval of LV ring3
Use this to set the RV-LV Interval of the left ventricular ring 3 strand. The range is from 10 ms to 160 ms. The default is 110 ms for LBBB and 90 ms for RBBB.

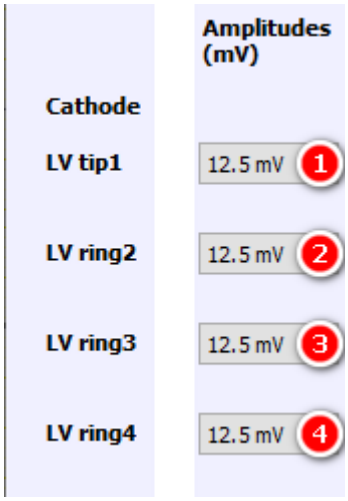
4 RV-LV Interval of LV ring4
Use this to set the RV-LV Interval of the left ventricular ring 4 strand. The range is from 10 ms to 160 ms. The default is 115 ms for LBBB and 85 ms for RBBB.

The controls are only accessible if a LBBB or RBBB is selected. In case of a RBBB, the controls determine the LV-RV intervals.

Please note: If a sensing signal is to be visible between two LV terminals, these two terminals must differ in amplitude and/or RV/LV interval.

Amplitudes (LV)

The annotated picture is part of the Left Ventricle Setup Dialog. The cathodes LV ring3 and ring4 are disabled for biventricular devices.



1 LV tip1 Amplitude
Use this to set the amplitude of LV tip1. Possible values are in the range from 1 mV to 15 mV. The default value is 12.5 mV.

2 LV ring2 Amplitude
Use this to set the amplitude of LV ring2. Possible values are in the range from 1 mV to 15 mV. The default value is 12.5 mV.

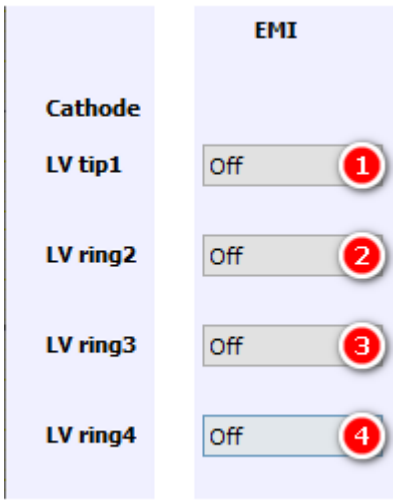
3 LV ring3 Amplitude
Use this to set the amplitude of LV ring3. Possible values are in the range from 1 mV to 15 mV. The default value is 12.5 mV.

4 LV ring4 Amplitude
Use this to set the amplitude of LV ring4. Possible values are in the range from 1 mV to 15 mV. The default value is 12.5 mV.

Please note: If a sensing signal is to be visible between two LV terminals, these two terminals must differ in amplitude and/or RV/LV interval.

EMI (LV)

The annotated picture is part of the Left Ventricle Setup Dialog. The cathodes LV ring3 and ring4 are disabled for biventricular devices.



1 LV tip1 EMI settings
Use this to set EMI for LV tip1. Possible values are Off, 50 Hz 5 mV, 50 Hz 0.5 mV, Artifacts, and Noise.

2 LV ring2 EMI settings
Use this to set EMI for LV ring2. Possible values are Off, 50 Hz 5 mV, 50 Hz 0.5 mV, Artifacts, and Noise.

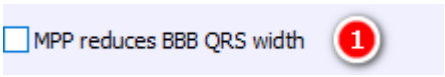
3 LV ring3 EMI settings
Use this to set EMI for LV ring3. Possible values are Off, 50 Hz 5 mV, 50 Hz 0.5 mV, Artifacts, and Noise.

4 LV ring4 EMI settings
Use this to set EMI for LV ring4. Possible values are Off, 50 Hz 5 mV, 50 Hz 0.5 mV, Artifacts, and Noise.

Use the EMI frequency dialog to select 50 Hz or 60 Hz EMI frequency.

Multi Point Pacing

The annotated picture is part of the Left Ventricle Setup Dialog.



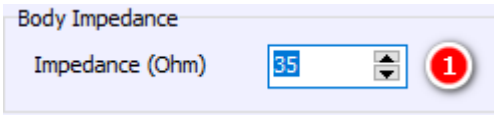
1 MPP reduces BBB QRS width
Select this checkbox to show the advantages of left ventricular multi point pacing.

CSP Parameters

Use this to set the parameters for Conduction System Pacing. This menu item is enabled when a conduction system pacing device type is selected.

Body Impedance

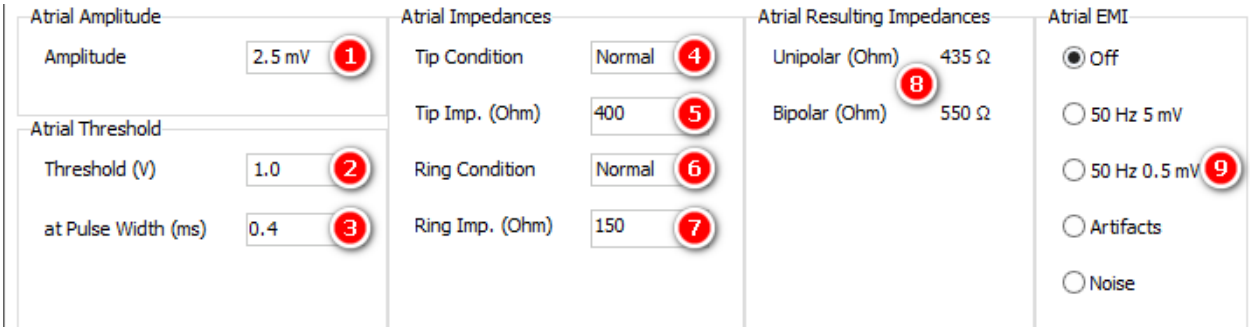
The annotated picture is part of the CSP Parameters Dialog.



1 Body Impedance
Use this to set the Body Impedance. The Body Impedance affects every unipolar pacemaker impedance. Possible values are 15 Ω to 45 Ω. See Impedances.

Atrial Parameters

The annotated picture is part of the CSP Parameters Dialog.
The simulator uses strength-duration curves for threshold calculation. Every PM threshold parameter is valid for a duration of 0.4 ms.
Click link to learn more about how to calculate impedances.



1 Atrial Amplitude
Use this to set the maximal intra-atrial amplitude during sinus rhythm. The range is from 0.15 mV to 6.0 mV.

2 Atrial Threshold Voltage
Use this to set the threshold voltage of the atrial channel. The range is from 0.5 V to 3.75 V. Use n.c. if you do not want to have capture at all.

3 Pulse Width (ms)
Use this to set the threshold pulse width of the atrial channel. The range is from 0.1 ms to 1.5 ns.

Threshold voltage and pulse width form the chronaxie point of the Strength Duration Curve.

4 Atrial Tip Defect Condition
Use this to set an electrode defect of the atrial tip strand. Possible values are Normal, Fracture, Leakage, Scar.

5 Atrial Tip Strand Impedance
For a normal condition, use this to set the impedance of the atrial tip strand. The range is from 150 Ω to 500 Ω.

6 Atrial Ring Defect Condition
Use this to set an electrode defect of the atrial ring strand. Possible values are Normal, Fracture, Leakage.

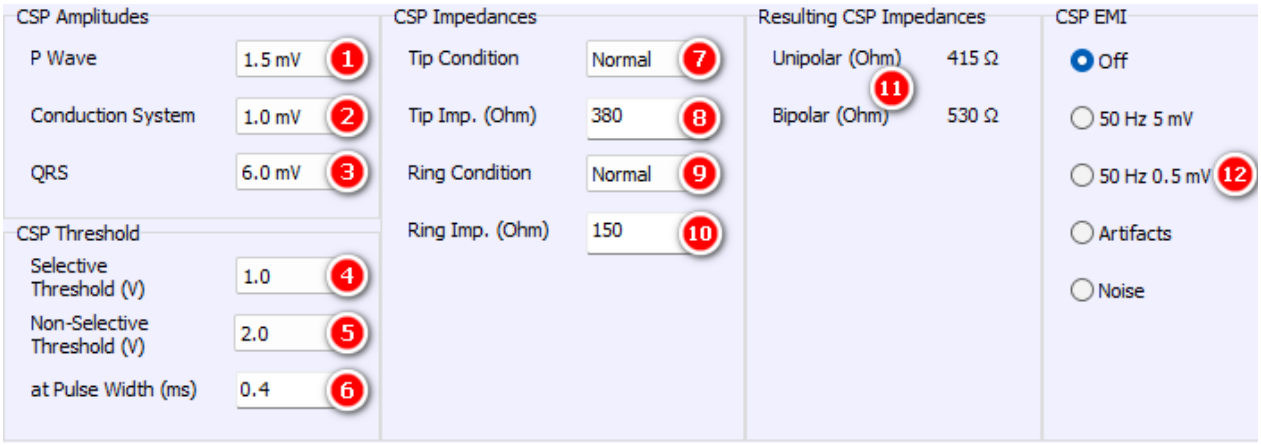
7 Atrial Ring Strand Impedance
For a normal condition, use this to set the impedance of the atrial ring strand. The range is from 150 Ω to 500 Ω.

8 Atrial Resulting Impedance
This panel displays the resulting impedances of the atrial channel.

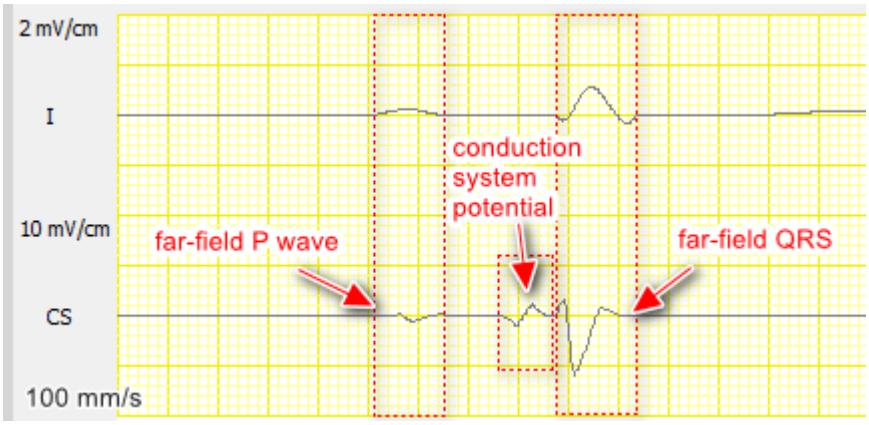
9 Atrial EMI
Use this to set the EMI of the atrial channel. Use the EMI Frequency dialog to select 50 Hz or 60 Hz.

CSP Parameters

The annotated picture is part of the CSP Parameters Dialog.
The simulator uses strength-duration curves for threshold calculation. Every PM threshold parameter is valid for a duration of 0.4 ms.
Click link to learn more about how to calculate impedances.



Three different signals can occur on an electrode connected to the conduction system: the P wave and the QRS far-field signal as well as the actual potential from the conduction system.
The individual signals can be influenced with the three different amplitudes.



1 P Wave Amplitude
Use this to set the maximal far-field P wave amplitude during sinus rhythm. The range is from 0 mV to 6.0 mV.

2 Conduction System Amplitude
Use this to set the maximal conduction system potential amplitude during sinus rhythm. The range is from 0.25 mV to 6.0 mV.

3 QRS Amplitude
Use this to set the maximal far-field QRS wave amplitude during sinus rhythm. The range is from 0 mV to 10.0 mV.

The responses to conduction system pacing can vary depending on the size of the stimulation pulse and the position of the electrode. The input fields for the threshold voltage can be used to simulate the responses to the size of the stimulation pulse.

- Selective stimulation means that ventricular activation occurs solely via the conduction system.
- In non-selective pacing, ventricular activation is the result of a fusion between activation via the conduction system and local septal myocardial activation.

 Selective CSP Threshold
Use this to set the threshold value for selective conduction system pacing. The range is from 0.5 V to 3.75 V. Use n.c. if you do not want to have capture at all.

 Non-Selective CSP Threshold
Use this to set the threshold value for non-selective conduction system pacing. The range is from 0.5 V to 3.75 V. Use n.c. if you do not want to have capture at all.

 CSP Pulse Width
Use this to set the threshold pulse width of the conduction system thresholds. The range is from 0.1 ms to 1.5 ns.

 CSP Tip Defect Condition
Use this to set an electrode defect of the conduction system tip strand. Possible values are Normal, Fracture, Leakage, Scar.

 CSP Tip Strand Impedance
For a normal condition, use this to set the impedance of the conduction system tip strand. The range is from 150 Ω to 500 Ω.

 CSP Ring Defect Condition
Use this to set an electrode defect of the conduction system ring strand. Possible values are Normal, Fracture, Leakage.

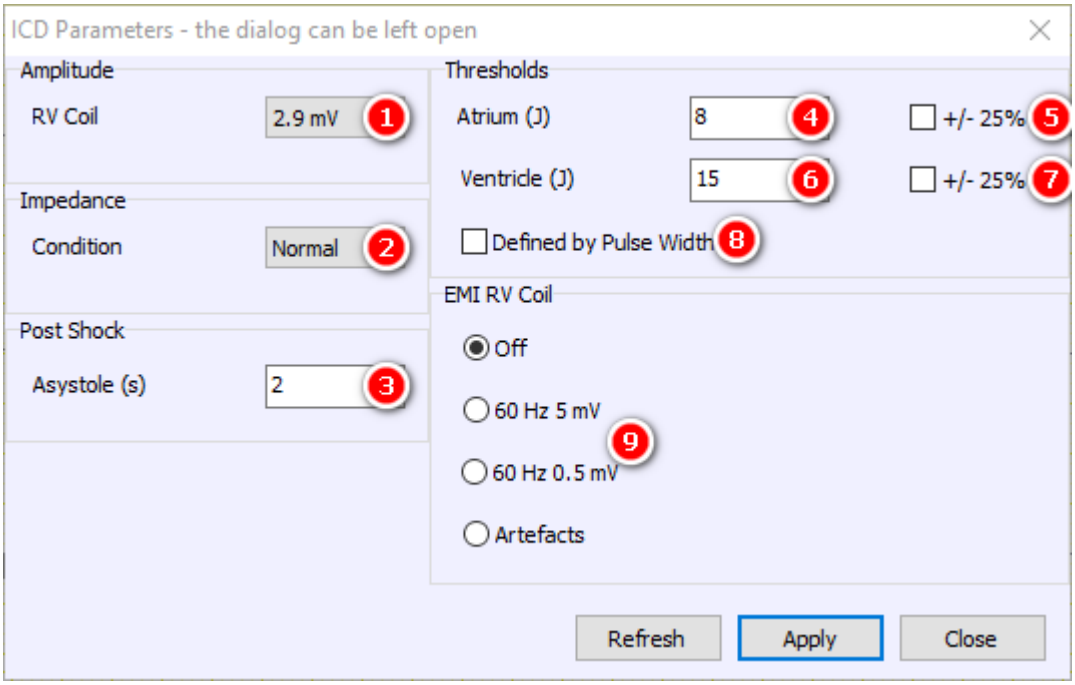
 CSP Ring Strand Impedance
For a normal condition, use this to set the impedance of the conduction system ring strand. The range is from 150 Ω to 500 Ω.

 CSP Resulting Impedance
This panel displays the resulting impedances of the conduction system channel.

 CSP EMI
Use this to set the EMI of the conduction system channel. Use the EMI Frequency dialog to select 50 Hz or 60 Hz.

ICD Parameters

Use this to set the parameters for an ICD. This menu item is disabled when a SICD device type is selected.



1 RV Coil Amplitude
Use this to set the maximal amplitude of the shock electrode during sinus rhythm. The range is from 0.2 mV to 4.0 mV.

2 RV Coil Defect Condition
Use this to set a fracture of the shock (RV coil) electrode. Possible values are Normal, Fracture.

3 Post Shock Asystole
Use this to set the duration in s of an asystole after a delivered shock. The range is from 0 s to 180 s.

The software provides the option to choose different ICD thresholds for atrium and ventricle. The reaction of the application on ICD shocks depends on the relation between shock energy and threshold. See Antitachycardia pacing, Cardioversion, and Defibrillation.

4 Atrial ICD Threshold
An atrial tachycardia will be terminated by a shock if the delivered energy is greater than this threshold in J.

5 Atrial ICD Threshold Variation
This provides the option to randomly vary the Atrial ICD Threshold in a range from -25% to +25%.

6 Ventricular ICD Threshold
A ventricular tachycardia will be terminated by a shock if the delivered energy is greater than this threshold in J.

7 Ventricular ICD Threshold Variation
This provides the option to randomly vary the Ventricular ICD Threshold in a from -25% to +25%.

8 Threshold defined by Pulse Width
A biphasic shock is only effective if the two pulses have defined widths.

Shock impedance	Pulse 1	Pulse 2
40 Ω	4 ms	3 ms
50 Ω	4.5 ms	3 ms

79 Ω	5 ms	2.5 ms

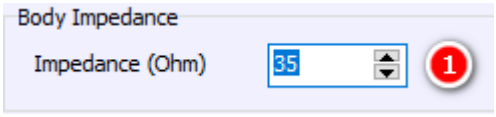
9 RV Coil EMI
Use this to set the EMI settings of the shock pathway. Use the EMI Frequency dialog to select 50 Hz or 60 Hz.

SICD Parameters

All settings for the SICD are accessible via the SICD Parameters in the Interface Menu. This menu item is enabled if a SICD device type is selected.

Body Impedance

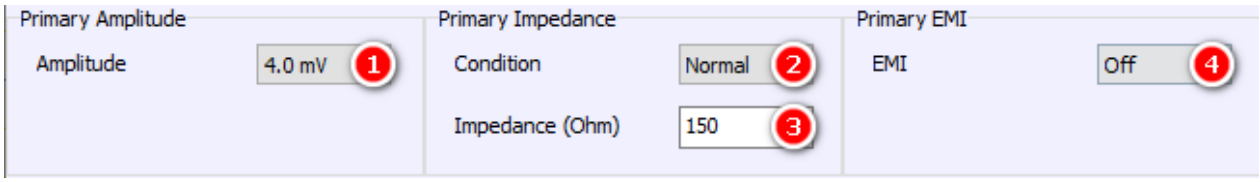
The annotated picture is part of the SICD Parameters Dialog.



1 Body Impedance
Use this to set the Body Impedance. The Body Impedance affects primary and secondary impedance. Possible values are 15 Ω to 45 Ω.
See Impedances.

Primary Parameters

The annotated picture is part of the SICD Parameters Dialog.
Use this to set the parameters of the Primary Strand.



1 Primary Amplitude
Use this to set the maximal amplitude of the primary vector during sinus rhythm.

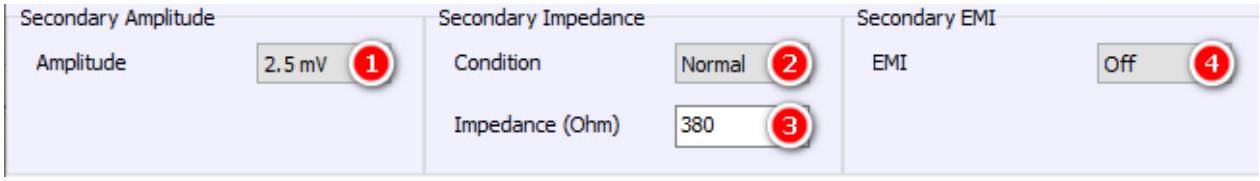
2 Primary Defect Condition
Use this to set an electrode defect of the primary strand. Possible values are Normal, Fracture, Leakage.

3 Primary Strand Impedance
For a normal condition, use this to set the impedance of the primary strand.

4 Primary EMI Settings
Use this to set the EMI settings of the primary channel. Possible values are Off, 50 Hz 5 mV, 50 Hz 0.5 mV, Artifacts, Artifacts2, and Wire Noise. Use the EMI Frequency dialog to select 50 Hz or 60 Hz.

Secondary Parameters

The annotated picture is part of the SICD Parameters Dialog.
Use this to set the parameters of the Secondary Strand.



1 Secondary Amplitude
Use this to set the maximal amplitude of the secondary vector during sinus rhythm.

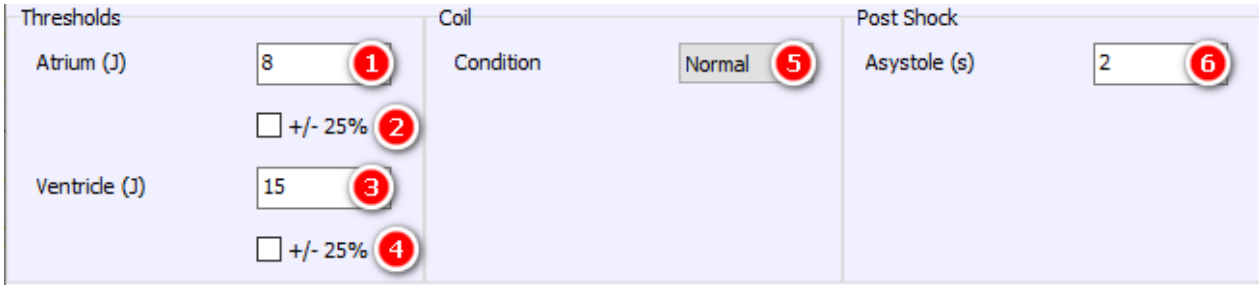
2 Secondary Defect Condition
Use this to set an electrode defect of the secondary strand. Possible values are Normal, Fracture, Leakage.

3 Secondary Strand Impedance
For a normal condition, use this to set the impedance of the secondary strand.

4 Secondary EMI Settings
Use this to set the EMI settings of the secondary channel. Possible values are Off, 50 Hz 5 mV, 50 Hz 0.5 mV, Artifacts, Artifacts2, and Wire Noise. Use the EMI Frequency dialog to select 50 Hz or 60 Hz.

Shock Coil Parameters

The annotated picture is part of the SICD Parameters Dialog.
Use this to set the parameters of the Shock Coil.



1 Atrial ICD Threshold
An atrial tachycardia will be terminated by a shock if the delivered energy is greater than this threshold in J.

2 Atrial ICD Threshold Variation
This provides the option to randomly vary the Atrial ICD Thresholds in a range of +/- 25%.

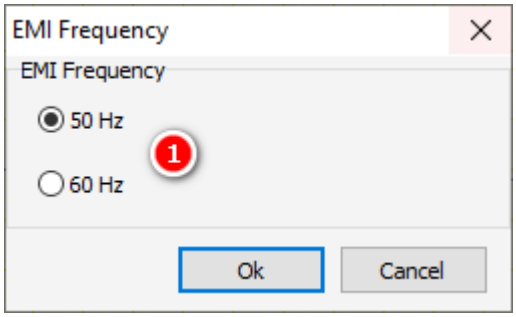
3 Ventricular ICD Threshold
A ventricular tachycardia will be terminated by a shock if the delivered energy is greater than this threshold in J.

4 Ventricular ICD Threshold Variation
This provides the option to randomly vary the Ventricular ICD Thresholds in a range of +/- 25%.

5 Coil Defect Condition
Use this to set a fracture of the shock (coil) electrode. Possible values are Normal, Fracture.

6 Post Shock Asystole
Use this to set the duration in s of an asystole after a delivered shock. The range is from 0 s to 180 s.

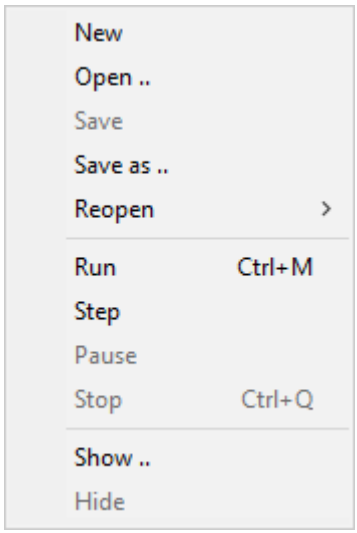
EMI Frequency



1 EMI Frequency
Use 50 or 60 Hz as mains frequency. This frequency affects the 50 Hz or 60 Hz EMI settings, respectively. The Alternating Current Demos are also affected by this setting.

Macro

The Macro menu contains all commands necessary to deal with Simulator Macros. Consult the macro manual for a detailed explanation of the macro language.



New

The New Menu Item shows the Macro Window. A frame for a new macro will be created. If the window currently contains an unsaved macro, a dialog will appear, allowing the macro to be saved if desired.

Open

The menu item opens the Open Macro Dialog. If the Macro Window currently contains an unsaved macro, a dialog will appear, allowing the macro to be saved if desired.
See also Folders.

Save

The Save menu item saves a macro. If the macro has not been saved before, Save As is called instead.
See also Folders.

Save As

The Save As menu item opens the Save Macro Dialog.
See also Folders.

Reopen

Click Reopen to open the list of recently saved or loaded macro files. Click the filename of the macro you want to load again.

Run

Click this menu item to start a macro. The macro will not start if it contains an error. In this case the dot at the left of the Macro Window shows the error position and the error description is shown in the message area of this window.
See Run Button.

Step

It is possible to execute a macro step by step by pressing this menu item. See Step Button.

Pause

The Pause menu item will interrupt a running macro. See Pause Button.

Stop

The Stop menu item terminates a long or endlessly running macro. See Stop button.

Show

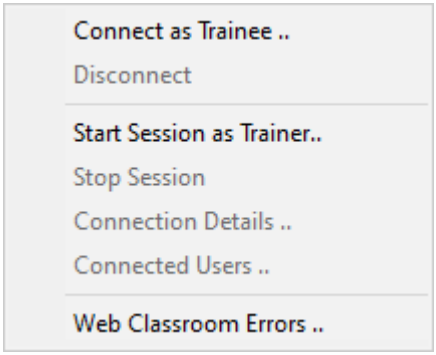
The Show Macro menu item shows a hidden Macro Window.

Hide

The Hide menu item hides a visible Macro Window. The macro itself will not be affected. Use this command if it is not necessary to watch the macro execute or to temporarily hide the window for any reason. The Show menu item displays the Macro Window again.

Classroom

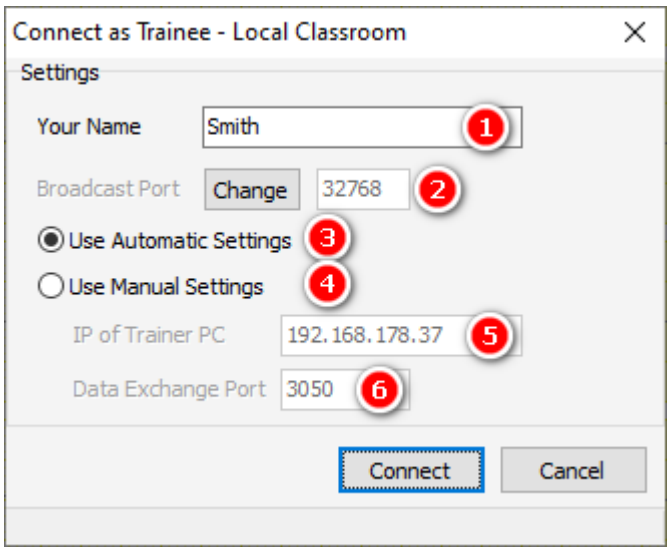
The Classroom menu is available when the Enable Classroom checkbox is selected in the Settings dialog. The dialogs that opened with the menu items "Connect as Trainer" and "Start Session as Trainer" differ depending on whether Local or Web Classroom has been selected.



Connect as Trainee - Local Classroom

This Connect as Trainee dialog is available when:

- the Enable Classroom checkbox in the Settings dialog is selected
- the Local Classroom radio button in the Settings dialog is selected
- the PC has not been set up as a Trainer (master) device
- the trainee is currently not connected



1 Your Name
Every trainee must enter a name of their choice of at least 3 characters.

2 Broadcast Port
It should not be necessary to change the Broadcast Port. It is used to find the Trainer PC automatically in the network.

3 Use Automatic Settings
Use this to let InterSim connect automatically to the Trainer PC.

4 Use Manual Settings
Use this if an automatic connection is not successful.

5 IP of Trainer PC
The IP of the Trainer PC is necessary for a manual connection.

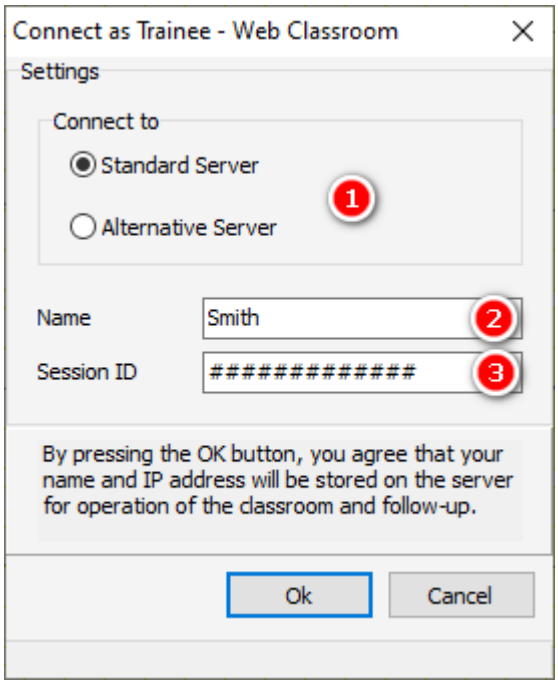
6 Data Exchange Port
It should not be necessary to change the Data Exchange Port. It is used to communicate with the Trainer PC.

See Connect as Trainee - Web Classroom and Classroom functionality.

Connect as Trainee - Web Classroom

This Connect as Trainee dialog is available when:

- the Enable Classroom checkbox in the Settings dialog is selected
- the Web Classroom radio button in the Settings dialog is selected
- the trainee is currently not connected



1 Connect to
The setting "Standard Server" should be used. Select "Alternative Server" only in case of a malfunction. The trainer and every trainee must use the same server.

2 Name
Every trainee must enter a name of their choice of at least 3 characters.

3 Session ID
The Session ID is a twelve-digit number and must be purchased (pay per use). The trainer and every trainee must use the same Session ID.

See Connect as Trainee - Local Classroom and Classroom functionality.

Disconnect

The Disconnect menu item is available when:

- the Enable Classroom checkbox in the Settings dialog is selected
- the trainee is currently connected

Use this to disconnect from a session.

Start Session as Trainer - Local Classroom

The Start Session as Trainer menu item is enabled when:

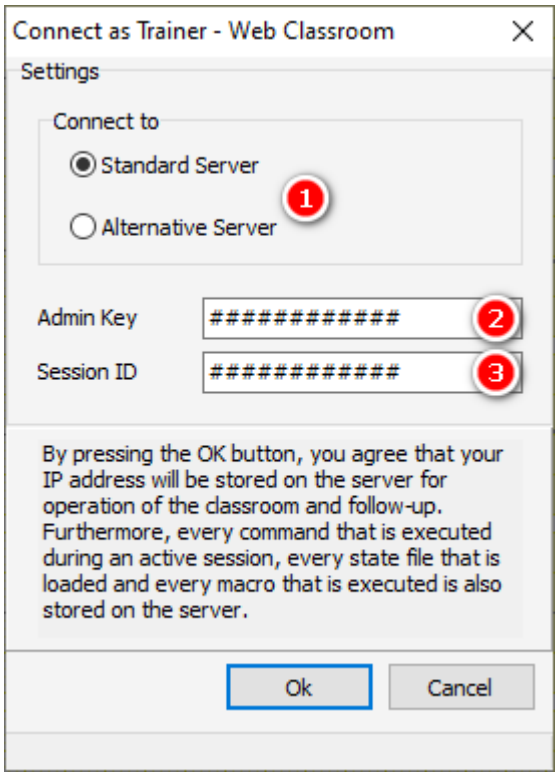
- the Enable Classroom checkbox in the Settings dialog is selected
- the Local Classroom radio button in the Settings dialog is selected
- the PC is set up as Trainer (Master) device
- no session is currently active

See Classroom functionality.

Start Session as Trainer - Web Classroom

The Start Session as Trainer menu item is enabled when:

- the Enable Classroom checkbox in the Settings dialog is selected
- the Web Classroom radio button in the Settings dialog is selected
- no session is currently active



1 Connect to
The setting "Standard Server" should be used. Select "Alternative Server" only in case of a malfunction. The trainer and every trainee must use the same server.

2 Admin Key
The Admin Key is a twelve-digit number and is supplied together with the Session ID (see below). The trainer should not share the admin key as it can be used to start and end sessions.

3 Session ID
The Session ID is a twelve-digit number and must be purchased (pay per use). The trainer and every trainee must use the same Session ID.

See Classroom functionality.

Stop Session

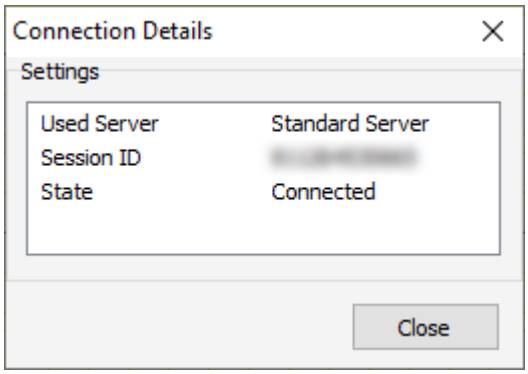
The Stop Session menu item is enabled when

- the Enable Classroom checkbox in the Settings dialog is selected
- the Web Classroom radio button in the Settings dialog is selected
- a session is currently active and started by the current PC

See Classroom functionality.

Connection Details

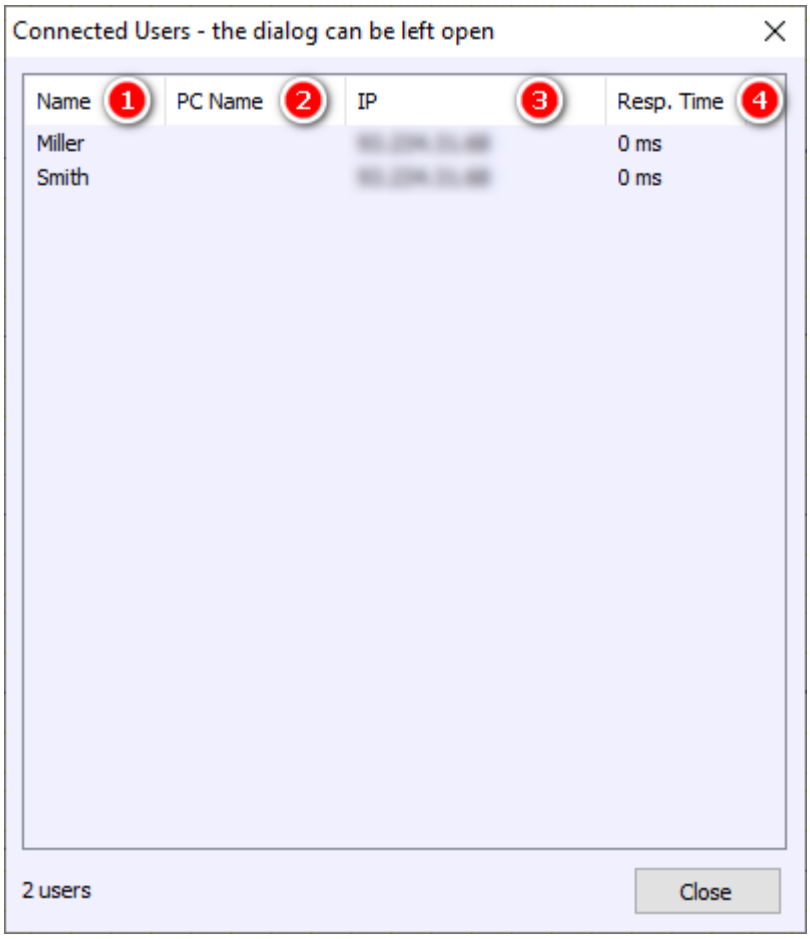
Use this dialog to see a summary of the data used.



See Classroom functionality.

Connected Users

Use this dialog to see the currently connected users.



1 Name
This column shows the name used by the trainee.

2 PC Name
This column shows the PC Name the trainee is working with. The column is filled only when working in the local classroom.

3 IP
The column shows the IP address assigned to the trainee's PC.

4 Resp. Time
The column shows the response time of the trainee's PC. In Local Classroom mode, the response time should not be much more than 10 ms. In Web Classroom mode, the response time can extend into the seconds range, depending on the user's location.

See Classroom functionality.

Web Classroom Errors

For troubleshooting purposes, any errors are listed in this dialog in Web Classroom mode.

See Classroom functionality.

Demos

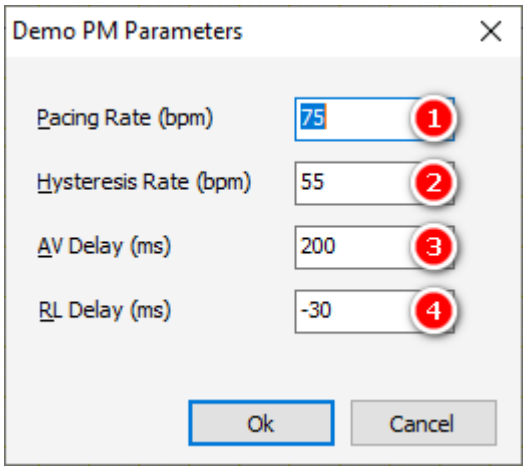
A number of pacemaker models and a defibrillation model are included in InterSim III that allow you to

demonstrate basic functions of these devices. You should, however, be aware that these models are limited to the basic behavior and do not include advanced device features. Use the InterSim III Interface and the Adapter Box to demonstrate the features of your products.

Off

Use the Off menu item to turn off a demo pacemaker and switch to the device connected via the adapter box.

Demo PM Parameters



1 Pacing Rate
Use this to set the pacing rate of the demo pacemaker.
The range is from 25 bpm to 405 bpm for A00, V00 and D00 and from 25 bpm to 150 bpm for all others.

2 Hysteresis Rate
Use this to set the hysteresis rate of the demo pacemaker.
The range is from 25 bpm to 150 bpm.

3 AV Delay
Use this to set the AV delay of the demo pacemaker.
The range is from 50 ms to 200 ms.

4 RL Delay
Use this to set the RL delay of the DDDRV demo pacemaker.
The range is from -100 ms (left before right) to 100 ms (right before left).

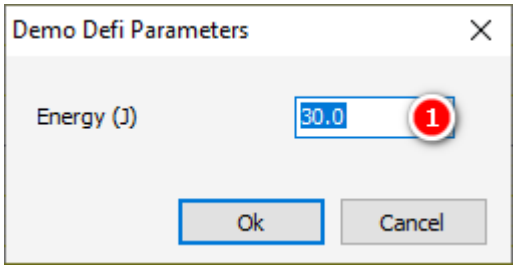
A00, AAI, V00, VVI, D00, DDI, VDD, DDD, DDD0V

Select one of the menu items to apply a Demo pacemaker according to the NASPE/BPEG code. Only the basic behavior is simulated.

50 Hz Atrial Demo, 50 Hz Ventricular Demo

These demo features show the induction of an atrial or a ventricular tachycardia, respectively, by means of 50 Hz stimulation. The result of the ventricular induction depends on the Chances for Induction settings An accident with a power cable can be a similar situation.

Demo ICD Parameters



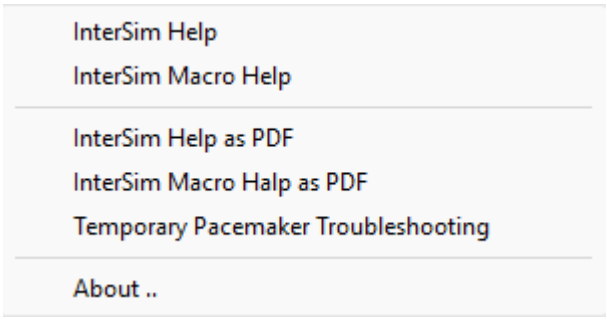
1 Energy
Use this to set the energy of the demo ICD. The range is from 0.5 to 40 J.

Deliver a Shock

The Shock menu item demonstrates a defibrillation shock. The shock appears after a charging period of about 5 seconds, terminates fibrillation and provokes a pause of the heart activity corresponding to the post shock asystole.

Help

The Help menu contains menu items to invoke the InterSim Help, the Macro Manual, and information about the simulator and the application.



InterSim Help

Use the InterSim Help menu item to access this help.

InterSim Macro Help

Use the InterSim Macro Help menu item to provoke the Macro help.

InterSim Help as PDF

Use this to open the InterSim Help Manual as PDF.

InterSim Macro Help as PDF

Use this to open the InterSim Macro Help Manual as PDF.

Temporary Pacemaker Troubleshooting

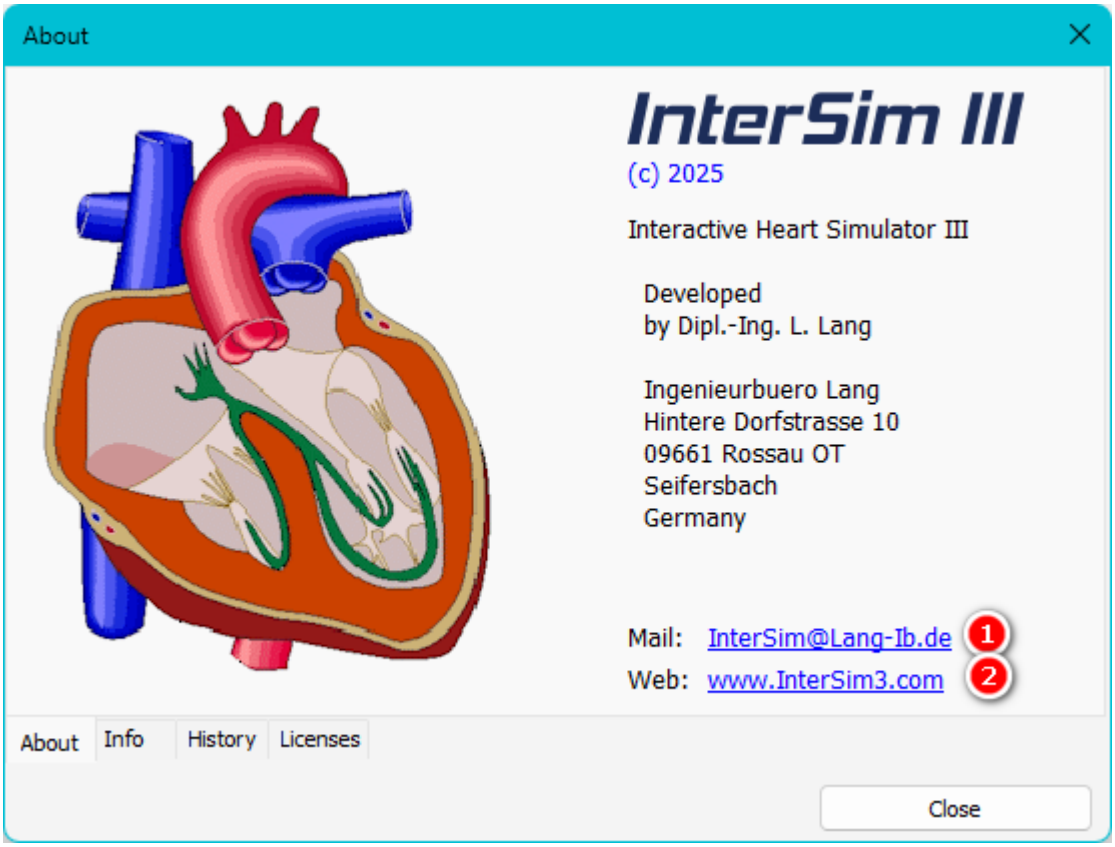
The PDF document provides assistance on how to simulate typical problems with temporary pacemakers.

About

The About Dialog summarizes some information about the simulator.

About Tab

The following image is part of the About dialog.

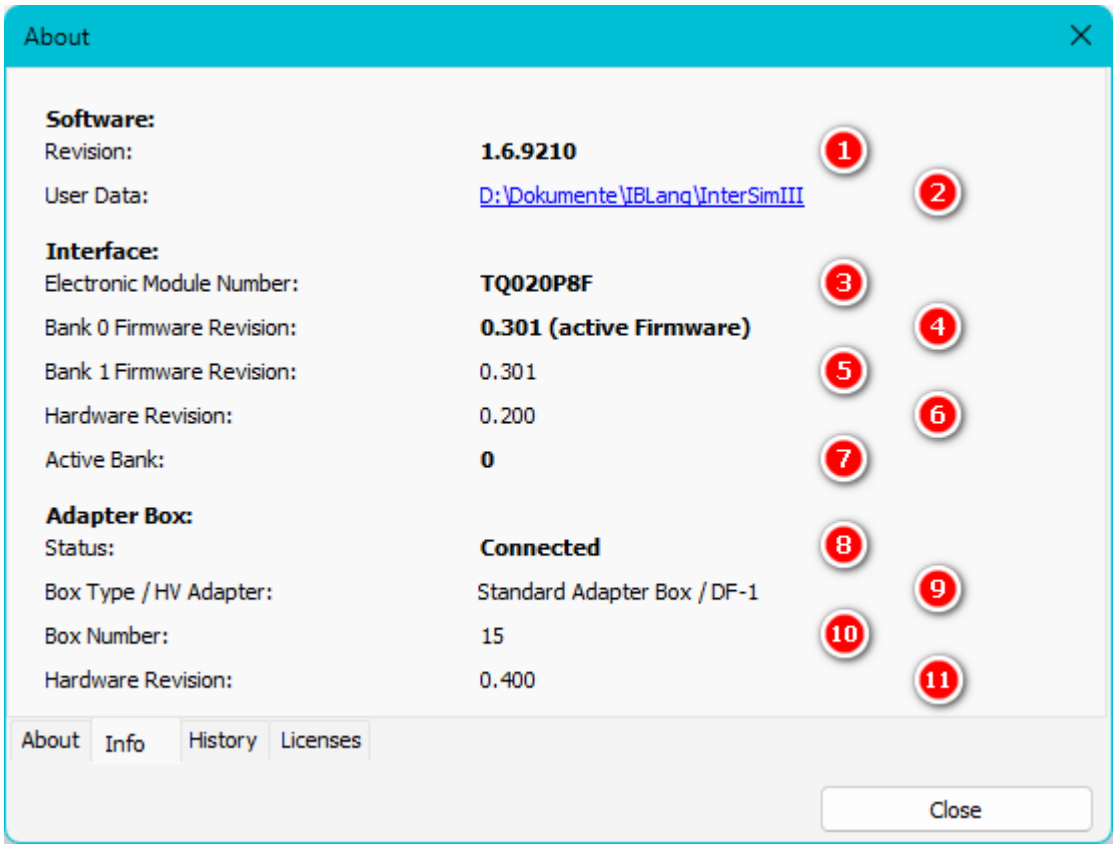


1 E-Mail Address
Use the link to send an e-mail to the InterSim team using your default e-mail program.

2 Web
Use this to open the InterSim homepage.

Info Tab

The following image is part of the About dialog.



1 Software Revision
This entry shows the current software revision. The software revision can also be found in the title bar.

2 User Data Folder
This entry shows where the User Data Folder is located. This is where log (journal) files, states, macros, application settings and other files are stored. Click on this link to open the User Data Folder in the explorer.

The next entries are available when an InterSim III Interface is connected.

3 Electronic Module Number
This is the unique number of the electronic module.

The simulator firmware is located in two different locations (banks) and may have different revision numbers.

4 Firmware Revision at Bank 0
The revision of the firmware on bank 0,

5 Firmware Revision at Bank 1
The revision of the firmware on bank 1,

6 Hardware Revision
The revision of the Interface hardware.

7 Active Bank
The bank that is currently used by the simulator. By default, the firmware with the higher revision number is used. If both banks contain the same firmware revision, bank 0 is used.

The next entries are available when an InterSim III Interface is connected in combination with an Adapter Box.

8 Status
The status of the Adapter Box: Connected or Not Connected

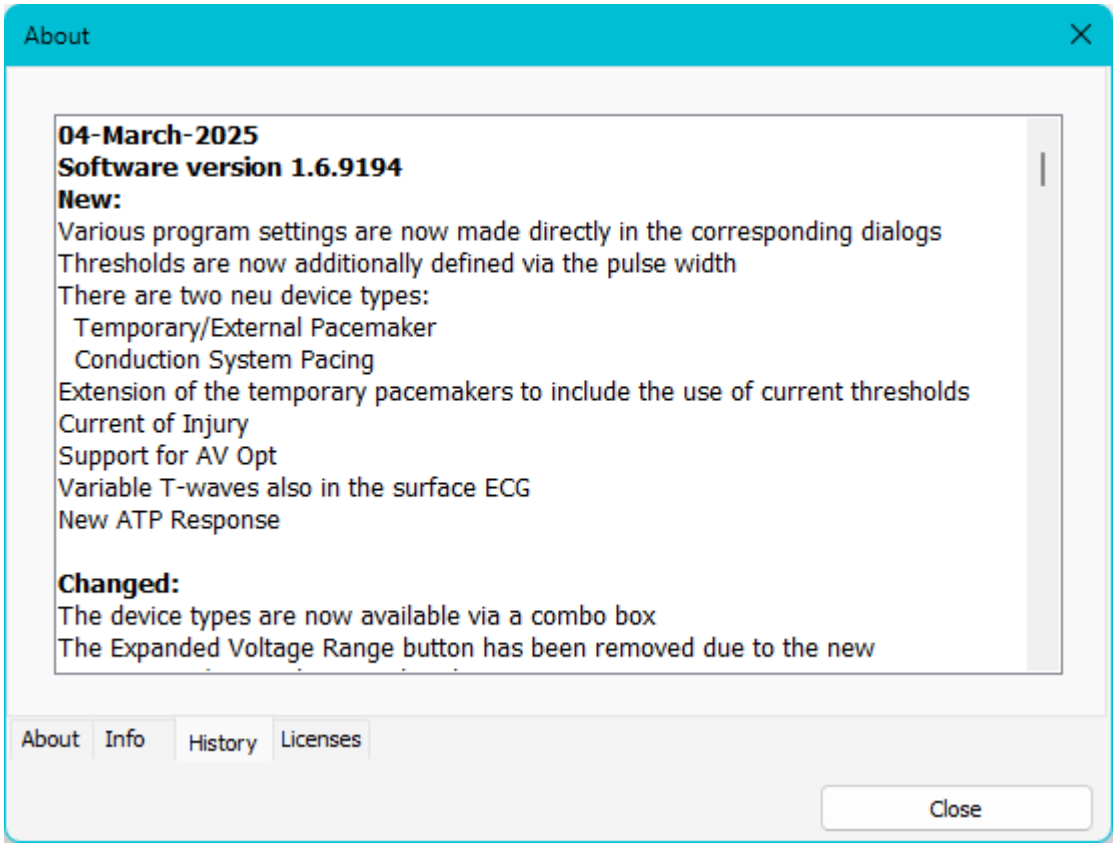
9 Box Type / HV Adapter
The type of the box and the type of the high voltage adapter

10 Device Number
The unique number of the Adapter Box.

11 Hardware Revision
The revision of the Adapter Box hardware.

History Tab

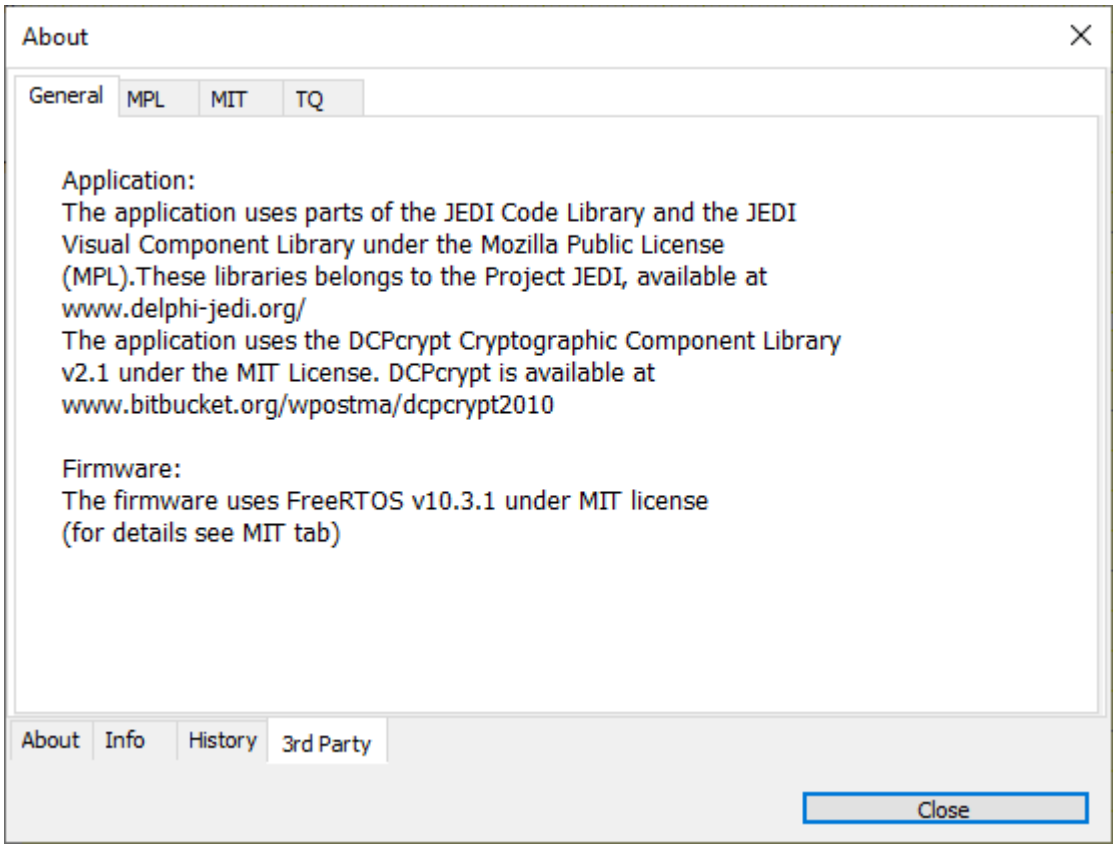
The following image is part of the About dialog.



See the Application Release History.

3rd Party Tab

The following image is part of the About dialog.



The 3rd Party tab contains information about 3rd Party Licenses.

Miscellaneous

Antitachycardia Pacing, Cardioversion, and Defibrillation

Atrium

Basic Rhythm	Action	Result	Example Simulator Settings	Example Programmer Settings
Induction				
Any type	3 sec 50 Hz	Atrial Fibrillation	Sinus Rhythm	atrial 50 Hz ~3 s
Sinus Rhythm Sinus Brady Sinus Arrest	7 consecutive pulses in between 450 and 550 ms + 3 extras just outside the refractory	Atrial Flutter	Sinus Rhythm 68 bpm	S1 500 ms 7x S2 300 ms S3 300 ms S4 300 ms
Sinus Rhythm Sinus Brady Sinus Arrest	3 extras just outside the refractory	Sinus Tachy 120 bpm	Sinus Rhythm 68 bpm	S1 300 ms 3x
Sinus Tachy > 180 bpm	3 extras just outside the refractory	Atrial Fibrillation	Sinus Tachy 220 bpm	S1 250 ms 3x
Atrial Flutter	3 extras just outside the refractory	Atrial Fibrillation	Atrial Flutter 2:1 220 bpm	S1 200 ms 3x
ATP/Termination				
Atrial Fibrillation	1.5 sec 50 Hz	Sinus Rhythm	Atrial Fibrillation	atrial 50 Hz ~1.5 s
Sinus Tachy < 180 bpm	3 extras just outside the refractory	in accordance with "Chances for ATP": default 100% Termination	Sinus Tachy 120 bpm	S1 260 ms 3x
Atrial Flutter	5 pulses fall between 90 and 75%	Sinus Rhythm	Atrial Flutter 2:1 230 bpm	S1 230 ms 5x

Ventricle

Basic Rhythm	Action	Result	Example Simulator Settings	Example programmer Settings
Induction				
Any type	5 sec 50 Hz	in accordance with "Chances for Induction": default 100% Ventricular Fibrillation		ventricular 50 Hz ~3 s
Sinus Rhythm Sinus Brady Sinus Arrest	5 consecutive pulses in between 550 and 650 ms + 3 extras just outside the refractory	LVTachy 167 bpm	Sinus Rhythm 68 bpm PR 190 ms	S1 600 ms 5x S2 310 ms S3 310 ms S4 310 ms
Sinus Rhythm Sinus Brady Sinus Arrest	5 consecutive pulses in between 450 and 550 ms + 3 extras just outside the refractory	LVTachy 200 bpm	Sinus Rhythm 68 bpm PR 190 ms	S1 500 ms 5x S2 310 ms S3 310 ms S4 310 ms
Sinus Rhythm Sinus Brady Sinus Arrest	5 consecutive pulses in between 350 and 450 ms + 3 extras just outside the refractory	LVTachy 214 bpm	Sinus Rhythm 68 bpm PR 190 ms	S1 400 ms 5x S2 310 ms S3 310 ms S4 310 ms
Polymorphous VT, Torsade de Pointes	4 pulses fall between 88 and 81%	Ventricular Fibrillation	Polymorphous VT	commanded ATP 84% 4 pulses

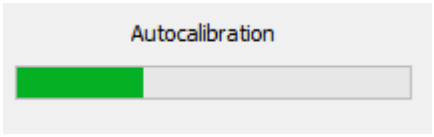
Basic Rhythm	Action	Result	Example Simulator Settings	Example programmer Settings
(sometimes coupling is difficult) Ventricular Flutter (reliable)				minimum interval 160 ms
ATP / Termination				
Ventricular Fibrillation	2 sec 50 Hz	Sinus Rhythm		ventricular 50 Hz ~1.5 s
LV Tachy RV Tachy <182 bpm	4 pulses fall between 88 and 81%	in accordance with "Chances for ATP": default 100% Termination	LV Tachy 165 bpm "Use new ATP response" not checked	ATP 4 pulses 84%
LV Tachy RV Tachy >182 bpm	8 pulses fall between 93 and 83%	Sinus Rhythm	LV Tachy 220 bpm "Use new ATP response" not checked	ATP 8 pulses 88%
LV Tachy RV Tachy	as many S1 pulses as necessary to overcome the distance to the tachy circuit at least one S2 pulse between 76 and 80%		LV Tachy 165 bpm "Use new ATP response" checked Distance to VT circuit 100 ms	

Defibrillation

Basic Rhythm	Action	Result	Example Simulator Settings	Example programmer Settings
Any type except Ventricular Flutter, Ventricular Fibrillation	shock in T wave energy between 0.5 - 5 J	in accordance with "Chances for Induction": default Ventricular Fibrillation	Sinus Rhythm 68 bpm	S1 400 ms * 8 S2 310 ms 1.1 J
LV Tachy RV Tachy Polymorphous VT Torsade de Pointes	shock in QRS energy < 50% of ventricular threshold	no reaction	Simulator threshold Ventricle 30 J Polymorphous VT	Commanded Shock Sync 11 J
LV Tachy RV Tachy Polymorphous VT Torsade de Pointes	shock in QRS energy between 50% and 100% of ventricular threshold	in accordance with "Chances for Induction": default Ventricular Fibrillation	Simulator threshold Ventricle 20 J LV Tachy 250 bpm	Commanded Shock Sync 17 J
LV Tachy RV Tachy Polymorphous VT Torsade de Pointes	shock in QRS energy > 100% of ventricular threshold	termination of ventricular rhythm	Simulator threshold Ventricle 15 J Ventricular Flutter	Commanded Shock Sync 21 J
Any type	energy > 100% of ventricular threshold	termination of ventricular rhythm	Simulator threshold Ventricle 15 J Ventricular Flutter	Therapy 21 J
Any type except Sinus Tachy	energy > 100% of atrial threshold	termination of atrial rhythm	Simulator thresholds: Ventricle 15 J Atrium 8 J Dual Tachycardia: Atrial Fibrillation Ventricular Fibrillation	Therapy Shock 1 14 J Shock 2 21 J
Any type	8 V, 2 s direct current pulse through the high voltage electrode	in accordance with "Chances for Induction": default Ventricular Fibrillation	Sinus Rhythm	Pulse 8 V, 2 s

Auto calibration

The auto calibration starts after each connection of the adapter box.



Calibration is used to minimize possible common mode voltages and maximize the accuracy of the pace pulse and shock measurement.

Chronotropic Incompetence

It is possible to show the chronotropic incompetence disease pattern and the related therapy by using a pacemaker with QT response. To do this:

- Insert a QT response capable pacemaker into the adapter box
- Choose the appropriate Device Type
- Reset the simulator by touching the Reset button
- Open the simulation state ChronotropicIncompetence or go to the Parameters menu, Exercise submenu item, and change the Sinus Rate Max to 78 bpm
- Check the Box Auto Sinus & Auto PR Interval
- Set the Workload to a value of 100% (or any other value but 0)
- Observe the change of the Exercise Level and the pacing rate of the pacemaker

Classroom functionality

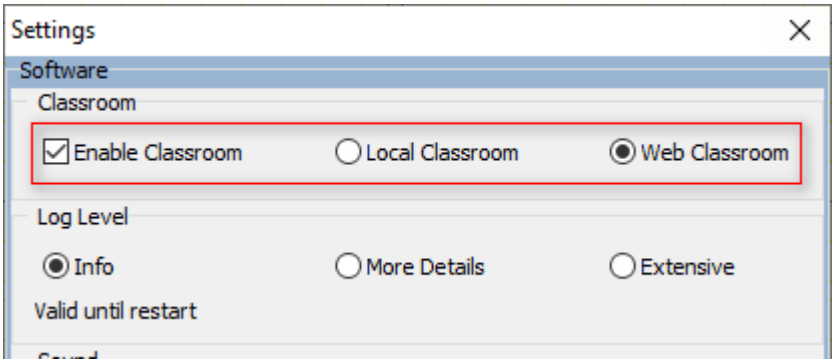
With the classroom version, InterSim III becomes the perfect companion in group training situations. Hook up as many as 20 InterSim III devices on a shared network or over the web. Use one trainer device to handle simulations on numerous simulators at the same time. The only requirement is an additional classroom package. In the case of the Local Classroom package, the integrated router spans a dedicated Ethernet or WIFI network. With the Web Classroom package, session IDs are included for immediate launch.

Regardless if you use InterSim III Interface, InterSim III Touch or multiple devices of both types combined – the classroom version gives you the freedom to combine them any way you want.

Use the Classroom as a Trainee

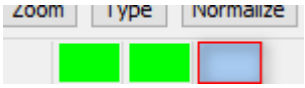
If you want to join a classroom session as a user, please follow these steps:

1. If the Classroom menu is not available, please turn it on via the File menu, Settings menu entry.

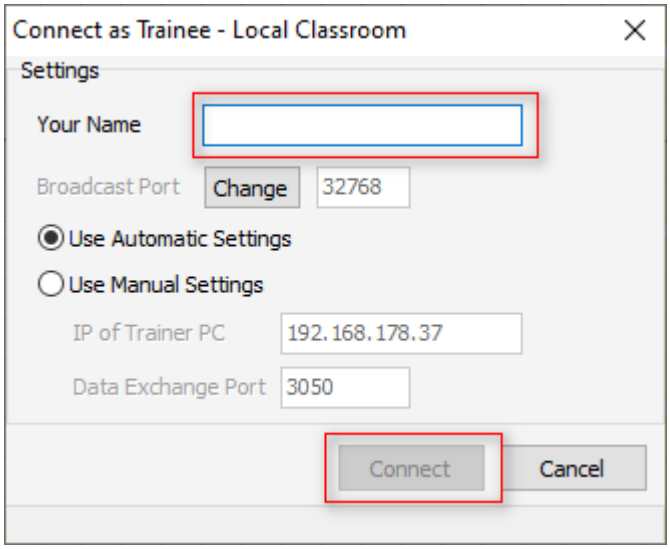


Select Local Classroom for a face-to-face training or Web Classroom if you are participating in an online

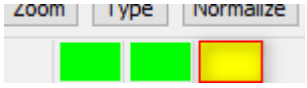
training.
The third colored field should light blue-gray after closing the dialog.



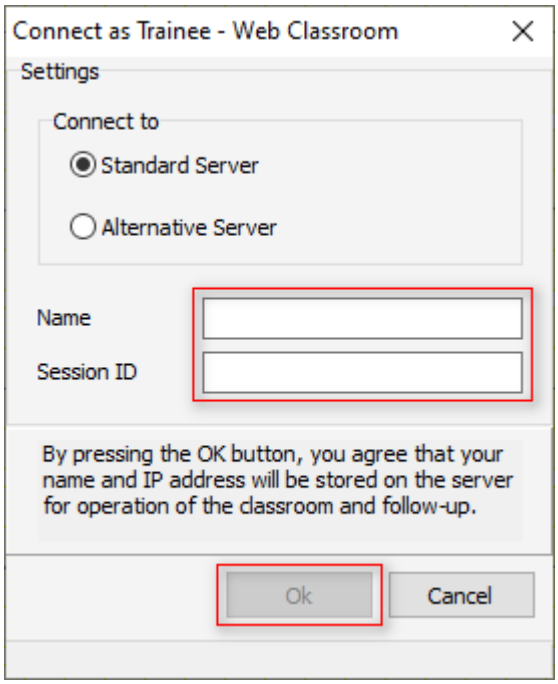
2. When instructed by the trainer, select the Classroom menu, Connect as Trainee menu item.
   - Connect as Trainee, Local Classroom:



Enter your name and press Connect.
When a connection is established, the dialog should close and the third colored field should light yellow.

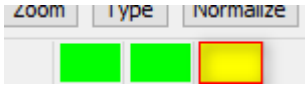


   - Connect as Trainee, Web Classroom:



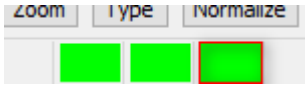
Enter your name and the Session ID provided by the trainer and press Ok.

When a connection is established, the dialog should close and the third colored field should light yellow.

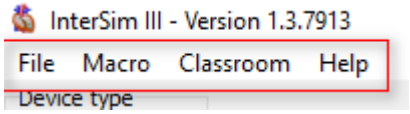


3. As soon as the trainer starts the session, the InterSim screen will change.

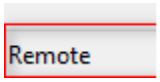
   - The third colored field should light green.

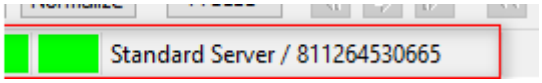


   - There are only a few menu entries left.



   - The Animated Heart, the Parameters group, the Prematures group, the Current States group, and the Exercise group are hidden.
   - The status bar shows only the entries Remote, the server used, and the Session ID.

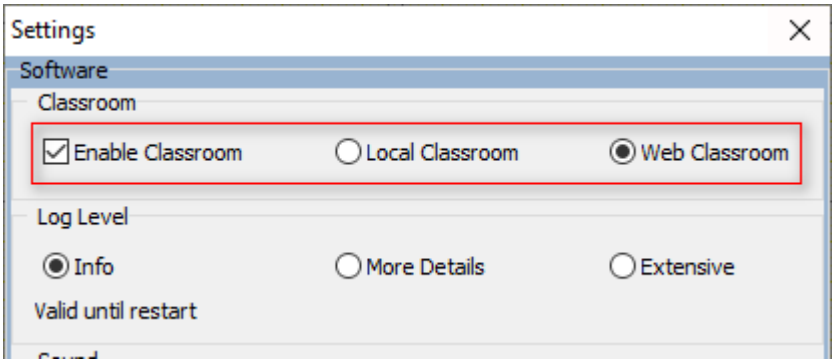




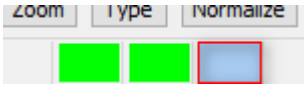
Use the Classroom as a Trainer

If you want to start and lead a classroom session as a trainer, please follow these steps:

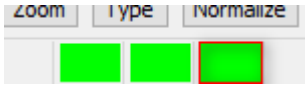
1. If the Classroom menu is not available, please turn it on via the File menu, Settings menu entry.



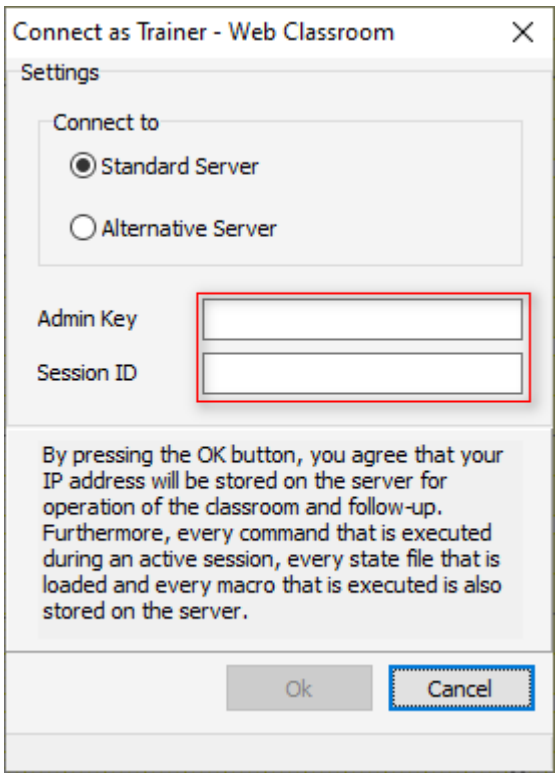
   Select Local Classroom for a face-to-face training or Web Classroom if you are going to start an online training.
   The third colored field should light blue-gray after closing the dialog.



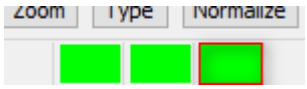
2. When you are ready to start a session, select the Classroom menu, Start Session as Trainer menu item.
   - Start Session as Trainer, Local Classroom:
     No further input is necessary. You can recognize the established connection by the third colored field, which should be green.



- Start Session as Trainer, Web Classroom:

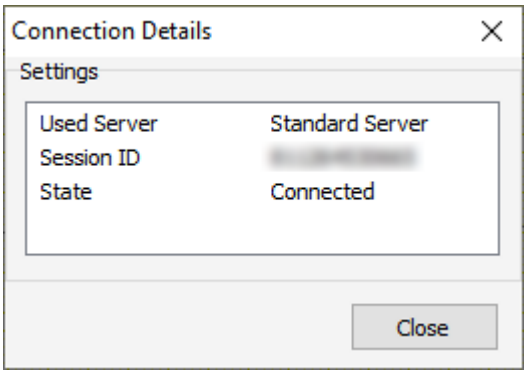


Enter the supplied twelve-digit Admin Key and the twelve-digit Session ID. After pressing OK, the third colored field should light green.

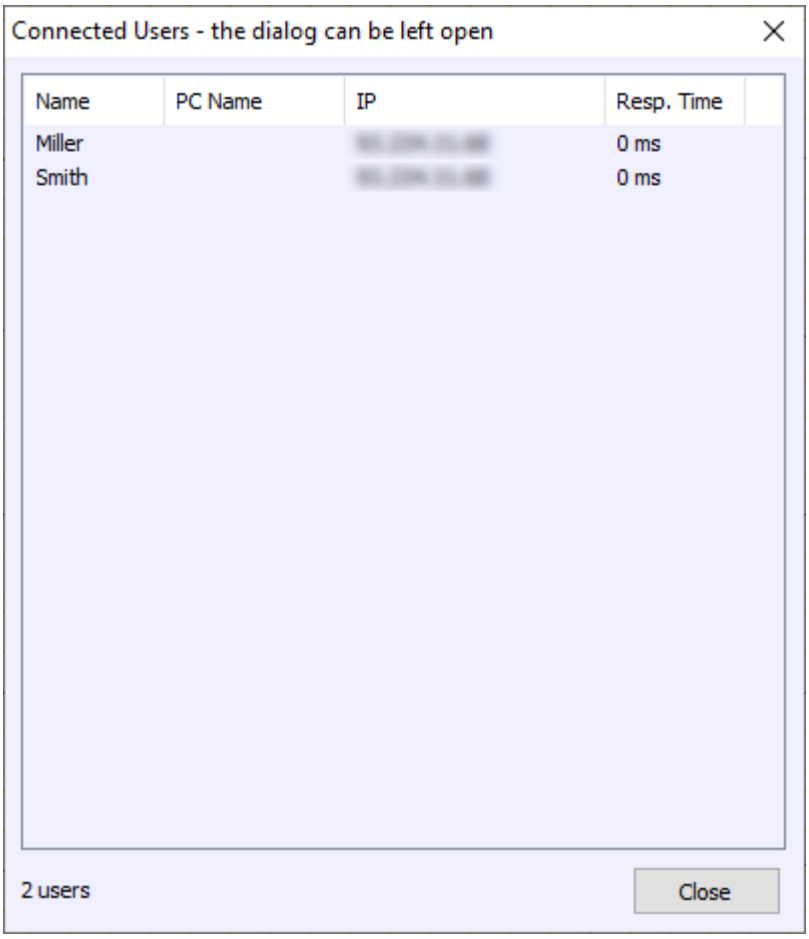


If in very rare cases there are problems with the Standard Server, try the Alternative Server and vice versa. This setting must be communicated to and used by all trainees.

3. Now you can make your simulator settings, load a State file or start a Macro. All actions are immediately transmitted to all connected trainees.
4. If you want do see the data used go to the Classroom menu, Connection Details menu item.



5. If you want to see the currently connected Trainees, go to the Classroom menu, Connected Users menu item. The PC name is filled only for the Local Classroom.



6. Stop the Session with the Stop Session menu item.

Electrode Conditions

The simulator can simulate different electrode conditions:

Condition	Impedance per strand	Threshold	Amplitude	EMI
Normal	defined by the Impedance edit control	defined by the Threshold edit control (strength duration curve)	defined by the Amplitude edit control	defined by the EMI controls
Fracture	> 3000 Ω	no capture	0	small artifacts
Leakage	< 200 Ω	3.5 V or defined by the Threshold edit control, whichever value is greater	0 (next FW release: 20% of the Amplitude edit control)	no
Scar	defined by the Impedance edit control	3.5 V or defined by the Threshold edit control, whichever value is greater	40% of Amplitude edit control	defined by the EMI controls

Folders

InterSim III uses a folder structure in the user's documents folder.

Journals: storage location of log files
Macros: storage location of macros
Pictures: storage location of ECG pictures
Sounds: storage location of sound files
States: storage location of state files
Userfiles: storage location of user files created by macros

Heartbeat Sound

It is possible to play a heartbeat sound with every heartbeat resp. every hiccup.
The simulator looks for the following WAVE files in the folder "Sounds":

- ASense.wav
- APace.wav
- LVSense.wav
- LVPace.wav
- RVSense.wav
- RVPace.wav
- Hiccup.wav

The simulator plays the sound if

- the appropriate event occurs
- the corresponding file is available
- the checkbox "Play Heartbeat Sound" in the Settings Dialog is checked.

See also Folders.

Impedances

The resulting impedance of a pacemaker channel consists of different parts. Note that the measured impedance can differ from the expected value.

Unipolar impedance

If no defect condition is selected, the unipolar impedance is calculated by the strand impedance 400 and the body impedance 35. With the values shown, the resulting unipolar impedance is 435 Ω.
With a selected defect, the impedance is mainly determined by the defect strand. The impedance is more than

3000 Ω with a Fracture condition. The impedance is less than 200 Ω with a Leakage condition.

Bipolar impedance

If no defect condition is selected, the bipolar impedance is calculated by two strand impedances, for example the impedance of RA Tip 400 and RA Ring 150. With the value shown, the resulting atrial bipolar impedance is 550 Ω.
With a Fracture condition, the bipolar impedance will reach a value of more than 3000 Ω.
With a Leakage condition in one strand, you should consider the impedance in the other strand. For example, the resulting bipolar impedance is 250 Ω in case of a Leakage condition in the RA Tip strand and an impedance of 200 Ω in the RA Ring strand. You should select a Leakage condition in both strands to get a true bipolar Leakage condition.

Look at the automatically calculated values of the resulting impedances for a quick overview.

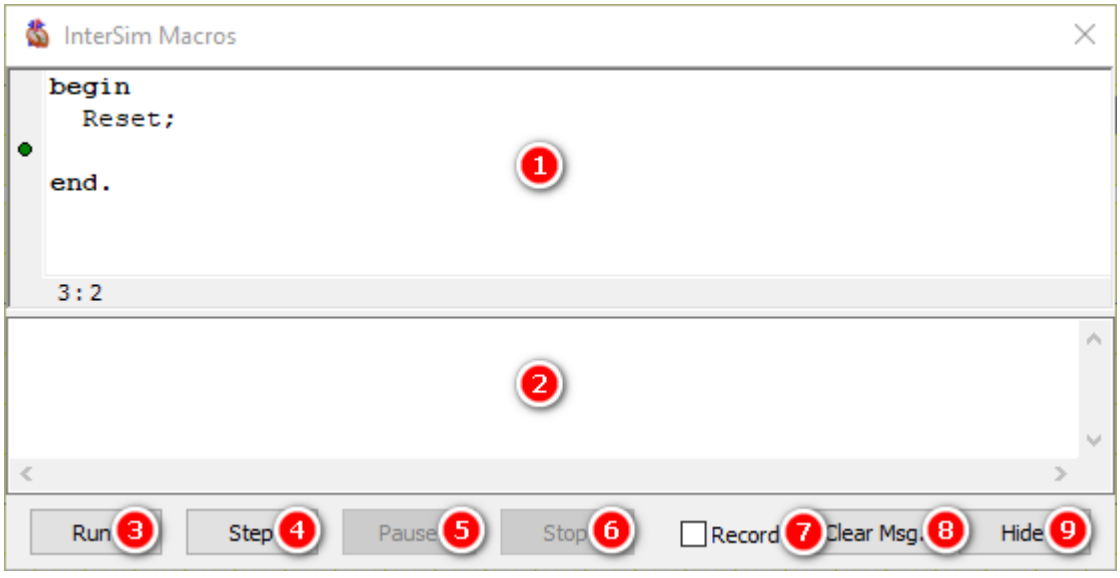
ICD Shock impedance

The shock impedance is composed of three individual impedances. The RV coil strand has an impedance of 20 Ω, the SVC coil strand 30 Ω, and the CAN strand 59 Ω. This results in a shock impedances dependent on the shock path:

Shock Path	Impedance
RV coil - CAN	79 Ω
RV coil - CAN||SVC coil	40 Ω
RV coil - SVC coil	50 Ω
RV coil||SVC coil - CAN	71 Ω

If the Fracture condition is selected for RV coil, the resulting shock impedance is a high-impedance state.
For sensing and pacing, the resulting impedance is the sum of the particular PM strand, the pocket impedance, the shock CAN strand, and the RV coil strand.

Macro Window



1 Macro Area
The Macro Area shows the currently loaded or created macro. It provides the necessary functions to enter or edit a Macro. The small green dot to the left of the text shows the position at which a new command will be inserted using the Record function. The dot turns red when the macro is running. In this case, the dot shows the command that is just executed.

 Message Area
This area shows the macro message output. Use Clear Msg. to clear all messages.

 Run
Press this button to start a macro. The macro will not start if it contains an error. In this case the dot at the left shows the error position and the error description is shown in the message area.

 Step
It is possible to execute a macro step by step by pressing this button.

 Pause
The Pause button will interrupt a running macro.

 Stop
The Stop button terminates a long or endlessly running macro.

 Record
Check this box to start the recording function. Every command taken or every parameter changed will be recorded by this function. The small green dot on the left indicates the position where the next entry will be inserted.

 Clear Msg.
Use this to clear the message area.

 Hide
This hides the window. The macro itself will not be affected. Use this button if it is not necessary to watch the macro execute or to temporarily hide the window for any reason. The Show menu item displays the Macro Window again.

PMT

Use the following PM settings to induce a PMT:

- PVARP: 220-280 ms
- Paced AV delay: 80-180 ms
- Sensitivity A: 0.25 mV
- Maximum tracking rate: 130 bpm

Load the predefined State PMT.dat.
Start the PMT with a coupled premature ventricular contraction rPVC.

Reentry Loop

It is possible to demonstrate a reentry loop that includes the accessory pathway.

- Reset the Simulator
- Enable Accessory Pathway (Blocks menu)
- Set PR interval to 150 ms (Parameters menu, Intervals menu item)
- Trigger the reentry loop with a IPVC (Premature)

The IPVC can pass through the accessory pathway and is transmitted to the atria because they are no longer refractory. From there, the wavefront is again conducted through the AV node back down to the ventricles. The delta waves disappear during the tachycardia because the ventricles are activated through the regular AV

pathway.

- Stop the reentry tachycardia with a repeat IPVC.

1 Delta Wave
Due to the Accessory Pathway, delta waves appear.

2 IPVC
The IPVC triggers the reentry tachycardia.

3 Reentry Tachycardia
The delta waves disappear due to the regular AV pathway.

Reset Values

Parameter	Value after Reset
Rates	
Atrial Rate	68 bpm
AVN Rate	40 bpm
Ventricular Rate	28 bpm
Max. Variation (%)	0%
Intervals	
PR Interval	170 ms
RP Interval	280 ms
Block Rate	171 bpm
Premature Contraction Coupling Interval	250 ms
Vulnerable Phase	60 ms
BBB QRS Width	160 ms
Exercise	
Exercise	Off
Workload	0%
Sinus Rest Rate	68 bpm
Sinus Max Rate	136 bpm
PR Rest Interval	170 ms
PR Min Interval	115 ms
Chances for ATP	
Termination	100%
Acceleration 50 ms	0%
Acceleration 70 ms	0%
Degeneration	0%
No Response	0%
New ATP response	Off

Chances for Induction	
Monomorphic Tachycardia 170 bpm	0%
Polymorphic Tachycardia	0%
Fibrillation	100%
No Response	0%
Far-Field R Wave	
Far-Field R Wave	Off
Intrinsic Far-Field VA Interval	40 ms
Paced Far-Field VA Interval	110 ms
PVC Amplitudes	
Left PVC	100%
Right PVC	100%
T Wave Amplitude Type	
T Wave Amplitude Type	Normal
Affects also Surface ECGs	no default value
Miscellaneous	
A-Pace Crosstalk	Off
A-Pace Crosstalk Latency	0 ms
A-Pace Crosstalk Width	80 ms
A-Pace-P Latency	10 ms
V-Pace-Q Latency	10 ms
R Wave Variability with Respirational Cycle	7%
ERAF	Off
ERVT	Off
Atrial Current of Injury	Off
Ventricular Current of Injury	Off
Conduction System Current of Injury	Off
Rhythms	
Rhythm	Sinus Rhythm
Dual Tachycardia	Off
Blocks	
AV Block	1:1 Conduction
Retrograde Conduction	Off
Accessory Pathway	Off
LBBB	
RBBB	
PM Parameters	
Body Impedance	35 Ω
Atrial Amplitude	2.5 mV
Atrial Threshold Voltage	1.0 V
Atrial Threshold Current	10.0 mA
Atrial Threshold Pulse Width	0.4 ms
Atrial Tip Condition	Normal
Atrial Tip Impedance	400 Ω
Atrial Ring Condition	Normal

Atrial Ring Impedance	150 Ω
Atrial EMI	Off
Right Ventricular Amplitude	12.5 mV
Right Ventricular Threshold Voltage	1.0 V
Right Ventricular Threshold Current	10.0 mA
Right Ventricular Threshold Pulse Width	0.4 ms
Right Ventricular Tip Condition	Normal
Right Ventricular Tip Impedance	380 Ω
Right Ventricular Ring Condition	Normal
Right Ventricular Ring Impedance	150 Ω
Right Ventricular EMI	Off
Use mA Thresholds for Temporary Pacemaker	no default value
Left Ventricle Setup	
Pacing Thresholds Pulse Width	0.4 ms
Left Ventricular Tip1 Condition	Normal
Left Ventricular Tip1 Impedance	400 Ω
Left Ventricular Tip1 RV-LV Interval	no BBB 0 ms LBBB 100 ms RBBB 100 ms
Left Ventricular Tip1 Amplitude	12.5 mV
Left Ventricular Tip1 EMI	Off
Left Ventricular Ring2 Condition	Normal
Left Ventricular Ring2 Impedance	390 Ω
Left Ventricular Ring2 RV-LV Interval	no BBB 5 ms LBBB 105 ms RBBB 95 ms
Left Ventricular Ring2 Amplitude	12.5 mV
Left Ventricular Ring2 EMI	Off
Left Ventricular Ring3 Condition	Normal
Left Ventricular Ring3 Impedance	440 Ω
Left Ventricular Ring3 RV-LV Interval	no BBB 10 ms LBBB 110 ms RBBB 90 ms
Left Ventricular Ring3 Amplitude	12.5 mV
Left Ventricular Ring3 EMI	Off
Left Ventricular Ring4 Condition	Normal
Left Ventricular Ring4 Impedance	400 Ω
Left Ventricular Ring4 RV-LV Interval	no BBB 15 ms LBBB 115 ms RBBB 85 ms
Left Ventricular Ring4 Amplitude	12.5 mV
Left Ventricular Ring4 EMI	Off
All Thresholds	1.0 V
All RV (anodal) Thresholds	n.c.
All PNS Thresholds	n.c.
MPP reduces BBB QRS Width	Off
CSP Parameters	
Body Impedance	35 Ω

Atrial Amplitude	2.5 mV
Atrial Threshold Voltage	1.0 V
Atrial Threshold Pulse Width	0.4 ms
Atrial Tip Condition	Normal
Atrial Tip Impedance	400 Ω
Atrial Ring Condition	Normal
Atrial Ring Impedance	150 Ω
Atrial EMI	Off
CSP P Wave Amplitude	0 mV
CSP Conduction System Amplitude	1 mV
CSP QRS Amplitude	6.0 mV
CSP Selective Threshold Voltage	1.0 V
CSP Non-Selective Threshold Voltage	2.0 V
CSP Threshold Pulse Width	0.4 mS
CSP Tip Condition	Normal
CSP Tip Impedance	380 Ω
CSP Ring Condition	Normal
CSP Ring Impedance	150 Ω
CSP EMI	Off
ICD Parameters	
RV Coil Amplitude	2.9 mV
RV Coil Condition	Normal
Post Shock Asystole	2 s
Atrial Threshold	8 J
Atrial Threshold Variation	Off
Ventricular Threshold	15 J
Ventricular Threshold Variation	Off
RV Coil EMI	Off
EMI Frequency	
Frequency	no default value
Demos	
Demo Pacemaker	Off
SICD Parameters	
Primary Amplitude	4.0 mV
Secondary Amplitude	2.5 mV
Threshold Atrium	8 J, same as ICD
Threshold Variation Atrium	Off, same as ICD
Threshold Ventricle	15 J, same as ICD
Threshold Variation Ventricle	Off, same as ICD
Body Impedance	35 Ω, same as PM
Primary Condition	Normal
Primary Impedance	150 Ω
Secondary Condition	Normal
Secondary Impedance	380 Ω
Coil Condition	Normal

Primary EMI	Off
Secondary EMI	Off
Post Shock Asystole	2 s, same as ICD

Rhythm Characteristics

Rhythm	Characteristic
Sinus Rhythm	Sinus rate 68 bpm
Sinus Brady	Sinus rate 39 bpm
Sinus Arrest	Sinus rate 0 bpm The ventricles follow an AV node escape rhythm.
Idioventr. Rhythm	Sinus rate 0 bpm AVN rate 0 bpm Ventricle rate 41 bpm Retrograde conduction on
Sinus Tachy	Sinus rate 120 bpm
Brady-Tachy Syndr.	The rhythm randomly alternates between Sinus Rhythm, Sinus Brady, Sinus Arrest, and Atrial Tachycardia.
Parox. Atrial Tachy	The rhythm randomly alternates between Sinus Rhythm and Atrial Tachycardia.
Atrial Flutter 2:1	Sinus rate 230 bpm Block rate 184 bpm
Atrial Flutter 3:1	Sinus rate 230 bpm Block rate 103 bpm
Atrial Flutter 4:1	Sinus rate 230 bpm Block rate 69 bpm
Atrial Fibrillation	Sinus rate randomly varies between 400 and 600 bpm
Comb. Atrial Flutter/Fib.	The rhythm randomly alternates between Atrial Flutter and Atrial Fibrillation.
AVNRT	AVN rate 180 bpm
LV Tachy Slow 130 bpm	Left ventricle rate 130 bpm
LV Tachy Medium 165 bpm	Left ventricle rate 165 bpm
LV Tachy Fast 220 bpm	Left ventricle rate 220 bpm
LV Tachy Very Fast 250 bpm	Left ventricle rate 250 bpm
RV Tachy Slow 130 bpm	Right ventricle rate 130 bpm
RV Tachy Medium 165 bpm	Right ventricle rate 165 bpm
RV Tachy Fast 220 bpm	Right ventricle rate 220 bpm
RV Tachy Very Fast 250 bpm	Right ventricle rate 250 bpm
Polymorphous VT	Ventricle rate between 200 and 250 bpm
Torsade de Pointes Coarse and Fine	Ventricle rate 221 bpm Coarse and Fine differ in the ECG
Ventricular Flutter	Ventricle rate 300 bpm
Ventricular Fibrillation Fine	Ventricle rate 214 and 250 bpm
Ventricular Fibrillation Coarse	Ventricle rate 250 and 300 bpm

Block Characteristics

Block	Characteristic
1:1 Conduction	Sinus Rate 68 bpm Block Rate 171 bpm

	PR interval 170 ms
AV Block I	PR conduction time is prolonged to 250 ms.
AV Block II Mobitz II 2:1	Sinus Rate 78 bpm Block Rate 52 bpm PR interval 170 ms Every second atrial action is transferred to the ventricle.
AV Block II Mobitz II 3:1	Sinus Rate 78 bpm Block Rate 52 bpm PR interval 170 ms Every third atrial action is transferred to the ventricle.
AV Block II Mobitz II 4:1	Sinus Rate 78 bpm Block Rate 52 bpm PR interval 170 ms Every fourth atrial action is transferred to the ventricle.
AV Block II Mobitz I	Sinus Rate 68 bpm Block Rate 63 bpm With each atrial action the PR conduction time is prolonged, so that the ventricular rate value constantly corresponds to the lower "block rate". The PR conduction time is prolonged until a ventricle action fails.
AV Block III	The AV conduction is completely interrupted.
Retrograde Conduction	Retrograde P waves are initiated according to ventricle actions under the condition that the conduction system is not refractory.
Accessory Pathway	An accessory pathway between the atrium and the upper left ventricle is connected. As a result of this accessory pathway, PR interval is reduced, Q wave in the surface ECG is superimposed by so-called delta wave and the entire QRS complex is prolonged.
LBBB	A left bundle branch block is switched on.
RBBB	A right bundle branch block is switched on.

Simulation States

Simulation States
A Simulation State is like a snapshot of all current settings (rates, intervals, rhythms, blocks, thresholds, impedances, etc.). The before saved states can be restored easily. It is possible to store as many states as the hard disc capacity allows.

MyStart State
This special state will be loaded at program start-up if it is available. Create this state by using the Save as MyStart menu item.

User Button States
A User Button State is an often used state accessible by the User State Buttons.

Trainer States
A Trainer State is a special Simulation State. Go to File Menu, Save as Trainer State to create such a state. When a Trainer state is reloaded, most of the entries and controls will be invisible. Select End Trainer State in the File menu to show all invisible entries and controls again.

See also Folders.

Create and use Simulation States step by step
1. Press Reset for default values of all parameters.
2. Set atrial rate to 80 bpm.
3. Set AV block III.
4. Save the state as MyFirstState.
5. Press Reset again or close and restart the simulator. All parameters are reset to default values.
6. Open your saved state.
7. Check the atrial rate, it should have 80 bpm.

Check the AV block. AV block III should be selected.

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